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THE FOUNDRY

VOL. 12. DETROIT, MICH., MARCH, 1898. No. 67.

From the Continent.

One of the best known shops of continental Europe is the establishment of H. Bollinckx at Brussels, Belgium. That it is favorably known is probably as much due to the active part Mr. Arthur Bollinckx, manager of the company, has taken in discussing questions of the day through our trade journals, as to the excellent qualities of the company's output. Mr. Bollinckx is noted for the readiness with which he adopts practical methods, whether these be English or American and also for the willingness with which he lets others become acquainted with his own practice. In a letter written from Brussels, Fred J. Miller, editor of the "American Machinist," referring to this establishment, says: "Like Professor Swcet, Mr. Bollinckx has, at least in spirit, the word 'welcome' over his shop door, evidently having full belief in the fact that a man who is really competent to compete with him can do so very well, without seeing his shop at all, and that one who is not fitted to become a serious competitor cannot qualify himself by walking through the shop." The logic of such reasoning is undoubtedly correct, and several American foundries, with high fences, watchmen, bull-dogs, and "Keep Out" signs, would in our opinion be as well off financially, and better morally, if they would drop the idea, that they have a corner on something in their shops, which no one else can produce.

Our first illustration furnishes an exterior view of the foundry of this concern which does not differ radically in appearance from any well-constructed shop in this country. Our next view shows the interior, from which it appears to be mainly lighted through overhead skylights as no sidelights are shown, nor would any of these be likely to prove very effective, as storage sheds take up the greater length of the side shown in Fig. 1.

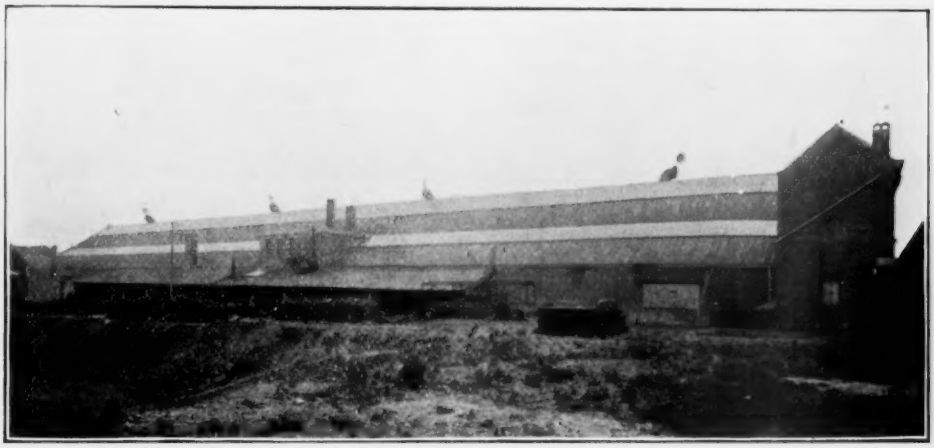

FIG. 1.

The entire foundry is traversed by three electric traveling cranes, each of these being equipped with three motors. The length of the shop is about 325 feet by a trifle over 80 feet in width, and is lighted and operated by electricity throughout. The pipes, seen on each side of the shop, with down-pointing branches, are part of a system of drying molds by hot air, wherever these happen to be located instead of carrying them to a core oven. The apparatus employed for drying molds is similar to that in use at the foundry of Carels Bros., at

Tech 55

Ghent, Belgium, and almost the identical system found in the works of Sulzer Bros., Winterthur, Switzerland, a description of cost of production in this establishment may be had from the statement by Mr. Bollinckx that the mean price of labor, including salar-

FIG. 2.

whose foundry appeared in THE FOUNDRY for August and September, 1897.

This is one of the European shops that has used considerable quantities of Ameri-

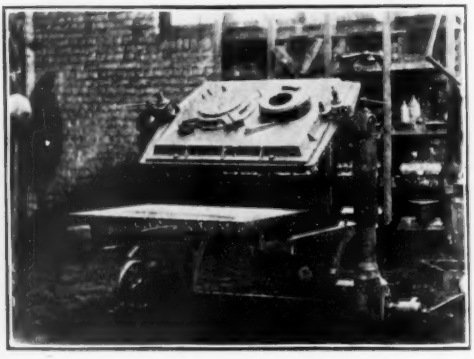

FIG. 3.

can pig iron, which has given good satisfaction, and Mr. Bollinckx says it is their intention to continue its use, as long as prices permit such a course. Some idea of the ies of the different foremen and clerks amount to 7.10 fr. per 100 kilograms of castings leaving the foundry. This is equivalent to about 62 cents per 100 lbs.

No outside work is done in the foundry, the whole output being consumed by their own machine-shop, and consists chiefly of castings for engines of various sizes. Most of the work is molded in green sand, with the exception of large cylinders, which are cast in loam. As in the shop of Sulzer Bros., the sand blast is employed for cleaning the greatest part of the castings.

To the right of Fig. 2 is shown the drying rooms for drying molding sand. It appears to be the European practice to dry their molding sand and pass it through a grinder before using which may occasionally account for the exceptional smoothness of some of their castings. The sand grinder at this foundry is manufactured by Krupp's and is composed of a drum barrel, covered with a fine meshed sieve, the lumps of sand being crushed by a number of small balls placed in the mill. After being thus treated

it is mixed with old sand and passed through a Gould & Eberhardt sand sifter.

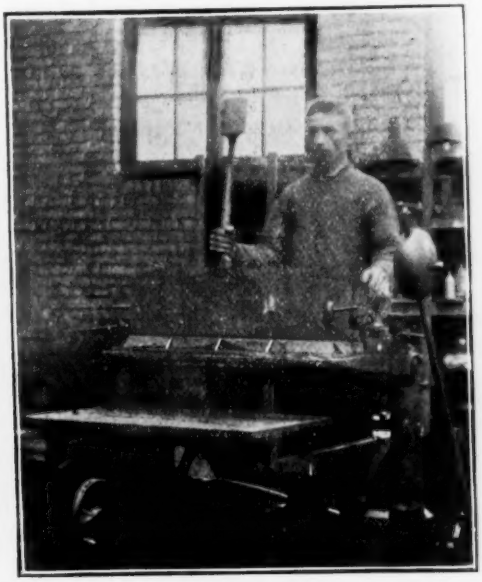

FIG. 4.

from where it is distributed to the different floors.

FIG. 5.

A form of molding machine somewhat differing from American construction, as seen at the present, is shown in Fig. 3. By observing the details in Figs. 4 and 5 it will be noticed that the mold is rammed by hand; the pattern, one-half of which is on each side of the plate shown, being drawn from the mold automatically after the latter has been turned over and deposited on the carrying table. Being unfamiliar with the actual capacity of this machine it is somewhat presumptive on our part to form an opinion of its utility, but we believe that more work could be turned out if it was so arranged as to have the patterns drawn downwards from the mold, instead of reversing the position of the flask and drawing the pattern upwards. However, this is a point on which we are open to conviction and we shall be pleased to publish any additional information tending to show valid reasons for this practice.

Something About Foundry Office Work.

BY A FOUNDRY CLERK.

While an order given to a foundry is made out for something which did not exist just then, the order given to a hardware store is contrary to such condition; consequently the hardware man is able to fill an order quicker than the foundry man can do it.

Along with an order sent to a foundry we may find one or more patterns and core-boxes, with many loose pieces; very often also blue prints. Besides all this, there may be chills, or there may be rods, shafts, brass linings, hooks and whatsoever should be united with a casting. By looking at the order we find something particular said about the pattern, the core, the metal, the time when castings are wanted and so forth. All of this, taken together, forms the character of an order, and this character must be well understood by a foreman, so that he may be able to comply with the wishes of the customer. All such particulars should also be observed by the practical clerk, so that he may, by a way of remarks on molder tickets, guide the molders and coremaker, or by a way of remarks in the foundry sheets guide the weighman or shipping clerk.

At times orders are piling up, and the clerk is bound to keep a sharp lookout when patterns go on the floor. Many times a very complicated case is turned out with no trou-

ble at all, while other times there is trouble with very simple cases. Bad luck, you know, is our expression. It may amuse the reader to hear from a case of bad luck. Although it exists in my own imagination, it is in no way impossible.

By an outside electric crane company three drums are wanted, made of one pattern, but each with a different length and different heads. The order reads thus:

No. 5786—1 drum B, as per print No. 101.
No. 5786—1 drum B, as per print No. 102. (Hurry this one.)
No. 5786—1 drum B, as per print No. 103.

By looking over the prints we find the sizes as follows:

1 48 inches long with 1 rib and head—A1
1 60 inches long with 2 ribs and head—A2
1 72 inches long with 3 ribs and head—A3

The pattern received is found to be right for the 60-inch, so in one case the pattern is stopped off, and in one case the pattern will have to be drawn. This is brought to the molder's notice by a remark on each of the two tickets. After unpacking, a close examination by the foreman and coremaker, everything is found complete, cores ordered, tickets made out, and the next day the 60-inch is made, but —— the luck it is scrap. A row between molder and foreman, while the clerk will order a core for next day. Another core on hand, flasks on the floor, nothing else just now. The one for which there is a core is made. Indeed, one after another is made without further trouble. The castings came out nice and smooth. The pattern is set aside, blue prints labeled and laid away, by and by the dates when made recorded. Out it goes of the clerk's mind.

Three months afterwards the following order is received:

Replace our Order No. 5786.

1 drum as per print No. 103. Quick.

Law me! When did we make that drum? A few minutes only and I know when made and who made it. The pattern carrier is notified, the core ordered, pattern rammed up same day, next day poured. The friendly face of the foreman next morning will tell me it was a success.

A week afterwards the condemned casting is returned, and we can see now what we could not before it left the foundry. After it had been one day in the lathe the defects came to light; hence the replace order. It remains for the clerk to make the entry into the condemned casting account, and mark the credit bill O K, if the weight is found correct. I suppose there is no further bother with this order, although there is nothing sure about this. The practical man no doubt will agree with me when I say so.

No Slag-Hole is Necessary.

By PAUL R. RAMP.

I have noticed several articles in THE FOUNDRY on cupola practice, such as economy in melting, tuyere location and fluxing. While I deem a great many theories logical, it is but natural that we should look for the weak points. Among the majority of foundrymen the slag-hole is a strict essential; but I say it is not. When you cannot run your cupola three or four hours without one, your cupola is not built right. Have good tuyere location and the right amount of blast pressure and you will never need a slag-hole. It is very true, with a soft blast, that flux will aid the impurities to pass off through a slag-hole, but what is the use of unnecessary bother in hauling limestone and other material used for fluxing and paying a man to keep a slag-hole open when it can be avoided? We have a 60-inch cupola and use a No. 9 Buffalo blower. It is a very common thing for us to melt forty tons at the rate of sixteen tons an hour without the aid of flux or slag-hole, and have the bottom drop clean every night. Our method is this: We use 1,000 pounds of coal and 900 pounds of coke for bed; 140 pounds of coke between each charge, each charge of iron being 2,000 pounds, which averages a little over a ratio of one to ten in a forty-ton heat. We use 15-ounce blast pressure, and that, coupled with the fact that the furnace has twenty-four tuyeres, sixteen being four inches in diameter and eight three inches in diameter, gives us enough heat to keep the slag above the liquid metal all through the heat, and consequently what is not blown out of the stack is held up until the bottom is dropped. Now this is not paper practice, but this cupola has been run in this manner for the last ten years to my knowledge, always with good results. Some will say, such high pressure burns the iron, but that is a mistake. This firm has been making castings for seven different railroads, and always gives satisfaction. Anyone knows that poor iron cannot be put into castings for locomotive

cylinders and Corliss engines and give good satisfaction. So much for burnt iron. And some might say, we burn too much fuel by using a high-blast pressure. But a firm whose time is worth about $40 or $50 an hour, which is the most economical—to spend an hour longer in melting or to use a little more fuel? Maybe the reader will say, we have not the same tuyere location. It would take but a few heats to pay for a new set of tuyeres with the time saved by our method. There are a great many advantages in this method; first, hot iron; second, clean iron, perfectly free from slag, and last, but not least, labor and time saved. And in conclusion let me say: Hot iron makes clean castings, because hot iron is purer than dull, sluggish metal. And you cannot get hot metal by slow melting. The quicker the fuel is consumed, the greater the heat.

CAST IRON NOTES.

Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

THE SIZE OF TEST BARS AGAIN.

I have an inquiry regarding a mixture, consisting of 2-5 Alabama coke iron, 2-5 a Southern Ohio iron (not silvery) and 1-5 remelt. The mixture made good castings, but some one thought the iron rotten. A test bar was sent and an opinion asked.

Unless a test bar is made right and used correctly, it will do more harm than good.

It seems very difficult to make a founder realize that the best use of the test bar is to show that the proper amount of silicon is in the casting. To find this the bar must be cast in a yoke and the shrinkage measured. If the shrinkage is greater than that which accompanies the most satisfactory castings, silicon must be increased. If the shrinkage is less, the iron mixture may be cheapened by using pig iron containing less silicon.

This is all the chemistry that a founder really needs to make good castings, because shrinkage measures the influence of silicon in the presence of all the varying proportions of other elements that are in the iron, and also with the influence of the fuel used and of all other conditions. The founder is a busy man. In this way he can take the measure of the quality of his iron by a graduated scale. This is the part of mechanical analysis, which gives the same practical information which it is claimed that chemical analysis can give.

Both methods take into account the influence of each element which enters into the composition.

If chemical analysis can give you the correct percentage of each element, you are obliged to estimate what the influence of such a composition would be in the casting. Mechanical analysis jumps all such estimates and measures directly such influence. It requires only the mental effort of reading the division of a scale.

When a mental estimate is made, the judgment is liable to err. The measure of the actual influence is always right.

But I am off the subject.

The test bar sent me was simply intended for a determination of strength.

Strength is not dependent upon the chemical composition of the iron, except in a very small degree, but is dependent upon the closeness of the grain.

The only way to determine strength is by means of a test bar.

If a test bar is used, it should always be made in the same way, as nearly as possible, and the size of the pattern.

The bar sent me was meant to be ½ inch square, but its hight was .545 and its breadth was .564, and it broke at 475. Reducing this by formula to what it should have been if the bar was .500 square, and the load is 354.

With the same irons, by varying the proportions used by a measure of shrinkage, I have no doubt that the strength could have been made 400, or even 450.

The larger the test bar the larger the grain, and consequently a larger casting is proportionately weaker than a small casting. For this reason, the formula does not give exactly the correct strength of a different size of casting.

Some years ago I constructed a chart by which the strength of any size of casting could be closely approximated from the strength of a test bar.* By that chart, if the above bar had been cast ½ inch square and if it had a shrinkage of .160, the strength would have been 370. The use of any one size of test bar, either 1 inch square or ½ inch square, with the chart referred

*Trans. Am. Soc. Mech. Eng., Vol. XVII., pp. 688 and 687.

to, is more practical than to try to get a test bar that would correspond to the size of each casting.

CAN CAST STEEL SCRAP BE CHANGED TO SOFT IRON?

Not by melting in a cupola or by any addition. A small portion of such scrap can be added to each charge of pig iron in a cupola and produce castings which will be stronger than if it had not been added. The castings will also be harder. Enough silicon iron must be added to produce solid castings.

The cupola is not hot enough to melt steel scrap alone, and if it were possible it would be harder than before melting, if it came in contact with the fuel.

THE INFLUENCE ON CHILL OF ADDITIONS OF BESSEMER PIG IRON.

The mixture consists of 40 per cent pig and 60 per cent old car wheels, and it is proposed to add 10 per cent of Bessemer pig.

Bessemer pig contains hardly any phosphorus or sulphur, generally manganese is less than 1 per cent. The silicon is often as high as 3 per cent, and the carbon is mostly graphite. The addition of such an iron to a wheel mixture would reduce the depth of the chill, and unless manganese was above 1 per cent would soften the chill.

When Bessemer pig is used for car wheels it is substituted instead of charcoal iron because it is cheaper, and to regain the chill which such iron would lessen, malleable iron scrap or something similar is added. By increasing the old car wheels until the heat is substantially a remelt of old wheels the chill would be too deep, and an addition of Bessemer pig would bring the chill back again to the desired depth.

By adding soft cuttings from boiler plate to the above mixture the depth of the chill would be increased, because the carbon and silicon would be decreased.

It would probably have little effect on hardness of chill, though much would depend upon the character of the steel scrap added.

Additions of both soft steel scrap and of Bessemer pig at the same time would produce a combination of the effects which would result from the addition of each separately.

Some foundries expect sea coal to make up for poor workmanship.

Cupola Linings.*

By LINSON H. DE VOE.

Telling a foundryman how to line a cupola may appear somewhat presumptive. It often happens, however, that disputes arise between the brick manufacturer and those using his product, simply because the latter is not treated as it should be after leaving his hands.

It is not always the best policy to give an order for fire brick to the lowest bidder, without considering the quality of his product. The economy of purchasing a certain brick can not be determined until it is known, what that brick will do, and this is affected more or less by the way the brick is laid in the cupola and the treatment it receives in that place. I will describe a few of the common methods and add such criticism as has come to me through experience.

SINGLE LINING, USING BLOCKS.

The term "blocks," as here applied, refers to a fire brick of two or more times the bulk of a standard 9-inch brick. There is no good reason why blocks should not outlast 9-inch bricks, unless improperly laid. The shell of the cupola expands when heated, and the heat also causes the lining to expand against the shell. When the cupola cools contraction of the shell occurs, but the bricks, being coated with iron and cinder, cannot respond to this squeezing; consequently they are crushed and cracked. To all outward appearances the bricks are as good as ever, and not until the man cleans out in the morning and the bricks crumble does any change appear. Then the bricks are condemned, but nothing is said about the laying of them. This occurs during the first two or three melts in a new lining. On two occasions only have I known that the foundryman realized the cause of the rapid disintegration. To avoid this, when laying the bricks a space must be left between the shell and the bricks ½ or ¾ inch, and this space must be filled with dry, finely ground cinder and fire clay mixed. This acts as a cushion and takes up the expansion and contraction.

SINGLE LINING, USING 9-INCH BRICKS.

The various 9-inch segment bricks, such as arch, bullhead, wedge and key, are made in

* From a paper read before the Philadelphia Foundrymen's Association.

so many sizes that almost any circle up to 84-inch diameter may be laid with them. Naturally more care must be observed in laying these, as they present many joints for the molten metal to attack. Frequently two or more sizes are combined to turn the circle perfectly. The melter and his helper are the best hands to employ to do the work, as masons usually make the bonds between the bricks too large, where only the very thinnest mortar should be rubbed on for bonding. In fact, some foundries simply dip the bricks into mortar made almost as fluid as water, and that is the best method, but requires more time in drying before running off a melt. Whether the bricks are laid to make a 4½ or 9-inch wall, the same rule applies regarding spacing between the wall and the shell. When the bricks are laid against the shell, with the 4½-inch wall, the crushing and disintegration is not noticed to any extent, but the wall soon loses its regularity and becomes a prey to the cinder and slag. In the 9-inch wall the crushing and disintegration is more noticeable than in the block lining. The spacing is an essential, regardless of the size of the bricks.

DOUBLE LINING, 9-INCH BRICKS AND BLOCKS.

This method is in general use, and should be the most economical of all linings, unless too much economy is observed when installing the linings. Many foundrymen, to save a few dollars, have the outer lining—the one against the shell—a 2½-inch wall. As there are no 9-inch segment bricks for laying in that manner the "square" brick is used; but it is evident that the space formed by the angles at the back of the bricks, as well as between the shell and the long side of the brick must be filled in so that some sort of bond is effected. The fire clay mortar soon dries and crumbles and the wall loses its stability. To avoid that trouble and annoyance a 4½-inch wall should be laid of 9-inch arch bricks. If the job is well done, and every joint is tight, the protecting wall will last many years. It is advisable to lay the inner lining of blocks close to the outer, without any space between. Iron sometimes works through, and should there be any space for the iron to run down the two walls become cemented, necessitating breaking and repairing what would otherwise have been a permanent lining.

The economy in double lining consists of the amount of work which the inner wall will perform. As there is no danger of the shell being burnt, it being protected by the permanent lining, the blocks may be used until nothing remains but a mere skin. In fact, the cupola always has a lining, and the annoyance of having the lining burn through to the shell is avoided.

DOUBLE LINING, TWO 4½-INCH WALLS, 9-INCH BRICKS.

There are many objections to this method, the principal one being lack of stability. Having but 4½ inches bearing surface, and being 9 inches high each row, the inclination is to top heaviness, which soon becomes apparent by the wall bulging, requiring frequent repair. Naturally the cupola expense account is rather heavy, and the foundryman goes from one manufacturer to another in his endeavors to obtain "good" bricks. In the majority of instances the fire bricks are first class, the actual trouble being in the foundry.

Intelligent discrimination in the selection of the proper lining for the work required, as well as quality, would save money for the foundryman, and the fire brick maker would not receive so many complaints. It is advisable to keep an extra lining on hand as accidents occur when least expected.

When laying bricks during cold weather they should be absolutely dry. The moisture they absorb from the fire clay is sufficient to make them "set" after laying. A good way to drive frost or moisture out of bricks is to set them around the boilers or over the core ovens. The bricks should be dipped into very thin mortar and be rubbed down to as tight a joint as possible, and not be laid in mortar as though they were red bricks. Every man who lays bricks in a cupola will say that he does not use thick mortar; but there are many opinions as to just what defines "thick" and "thin." A metal hammer should never be used to hit a brick; a mallet gives all the force needed without injury to the brick, but a hammer crushes or cracks fire bricks at every blow. The fire mortar or fire clay must be of excellent quality or the molten iron will flux it. When possible, enough hard burned bricks should be selected to lay up for 2 or 3 feet opposite and below the charging door. Some melters are careless and throw pig and scrap with such violence that the lining opposite the door is destroyed more rapidly than that above the tuyeres. Many fire bricks are condemned

through the recklessness of the man who "chips out" in the morning. He endeavors to rush matters which should be done carefully. In many instances the man is not to be blamed; the heap of cinders below the bed plate has not cooled to any extent, and has been adding its heat to that of the cupola's interior, consequently the job is too warm to linger over. But that excuse will not apply to all cases, and great care should be exercised to the end that the bricks are not broken or chipped unnecessarily. I find that very little supervision is given to that part of the work, and many times good bricks have been condemned owing to the helper's indifference.

If the wind is shut off two or three minutes before dropping the bottom, and some iron left to run out with the cinder, the tendency of the iron is to drag out a goodly portion of the cinder which would otherwise adhere to the bricks. Running out the last pound of iron and then shutting off the wind is a detriment to the bricks.

As to the qualities necessary to make good bricks the clay must be highly refractory, blended in such manner that the finished article for the work intended (in this case cupola linings) shall be fairly close, hard enough to stand erosion and jarring, yet porous enough to quickly expel the heat absorbed during the melt. To buy cupola bricks on the strength of chemical analysis is an unwise proceeding. Analysis of fire bricks, for some work, is like statistics—when trustworthy they sometimes make one feel very uncomfortable. The Woodbridge clays are better adapted for cupola purposes than those from other districts. They are plastic and refractory and have excellent binding qualities.

In conclusion, I beg to submit estimate of cost of cupola lining for one year per pound of iron melted. This estimate is not a theoretical one, but is taken from figures furnished by foundrymen to me at various times. I find that there are more cupolas 60-inch diameter lined down to 48-inch than any other size, and have adopted that size for my illustration. Usually that size is lined for 15 feet with cupola blocks, which brings it to the top of the charging door. Above that hight the lining will last many years. The prices are based on small quantities, less than carloads, and are purposely quoted at an advance over the actual selling price. Labor, however, is the average wages paid in 20 shops.

60-INCH SHELL LINED TO 48 INCHES, 17 BLOCKS TO A COURSE, OF 4 INCHES HIGH.

Cupola lining, 15 feet (cost put in foundry)	$100.00
Fire mortar, to lay above	4.50
Labor, 2 men 1 day at $2 per day each	4.00
Relining at melting zone at end of six months, say 4 feet	26.80
Labor, 2 men ½ day each	2.00
*Labor, "picking" or cleaning interior of cupola daily for 280 working days, 1 man 2 hours daily at 18 cents per hour	100.80
Clay required for matted "daub," about 5 cents daily	14 00
Total cost lining and repairs end of year	$252.10
9 feet of this lining is still good for at least another year, hence is worth 50 per cent. of original cost	32.85
Net cost lining	$219.25

The product of a cupola this size is about 10 tons daily=2,800 tons annually=5,600,000 pounds, equivalent to 0.0039 cent per pound of iron melted, or 7.8 cents per ton.

*This allows for 61 holidays and Sundays and two weeks for stock taking.

Soft Close-Grained Iron.

Editor THE FOUNDRY:

For a certain kind of dies, it is sought to obtain the softest kind of iron possible, as a great amount of highly paid labor is expended in carving the necessary ornamentations on the dies, and with an iron inclined to hardness, this item is greatly increased. These castings are also wanted of a very fine grain; in fact the texture cannot be too close to meet the requirements in the case. As the thickness of metal is two inches and upwards, we have found it difficult—to tell the truth, we have never obtained exactly what is wanted. If we secure a very soft casting by increased silicon we have a coarse-grained casting, and on the other hand, if the grain is anywhere near right, the casting is too hard to be finished economically by the die sinkers. Will some of THE FOUNDRY'S experienced readers tell us how they would obtain the greatest softness combined with a very close grain?

EUREKA FOUNDRY CO.

Hard Iron for Grinders.

What mixture of iron will form the hardest and most lasting casting for grinding mills?

S. O. L.

THE FOUNDRY

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JOHN A. PENTON - - - EDITOR AND MANAGER.
HENRY HANSEN - - - - ASSOCIATE EDITOR.

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Single Copies, 15 Cents.

Advertising Rates are Printed in Each Issue, on Page Containing Alphabetical Index to Advertisers.

Space in advertising pages only is for sale.

We invite correspondence on subjects pertaining to any part of the foundry business.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.

The Detroit News Co. will supply the trade with THE FOUNDRY, through the regular channels of the American News Co.

Entered at the Post Office at Detroit, Mich., as second-class matter.

5,300.

For some time past we have been promising ourselves that we would toot our own horn to the extent of about a column whenever our regular paid circulation exceeded the 5,000 mark. The above figures are our excuse for devoting a small space to this purpose.

Anyone acquainted with the circulation of trade journals knows that but few of these have an issue above 2,500 copies. Therefore it is with considerable pride that we, after a few short years, and not very good years at that, either, can point to this result of our labor in an uncultivated field. To the intelligent men of the trade, composing our subscribers, are due our thanks for the co-operation they have given us, and we assure them that we will in the future, as in the past, print all that is worth printing concerning the foundry business.

To our advertisers, we will say that ours is a paid circulation, the only kind it pays to patronize. As each copy of THE FOUNDRY costs more to produce than what our subscribers pay therefor, it is reasonably to be supposed that our free list is cut down to the lowest number, and of the present issue more than fifty-one hundred copies go to paid subscribers.

By substituting cheap paper and low priced engravings and printing for our present practice of employing the best, we could afford to give our paper to those who did not want to pay for it, but it is evident that such a course could prove of no benefit to either ourselves or the advertiser.

As our reading columns contain nothing of interest except to foundrymen, this is the only class of people who pay for it. The advertiser knows beforehand whom he is going to reach.

Confining itself to its own field, THE FOUNDRY is the only foundry paper. In its columns appear nothing but shop talk, which is preserved for reference, and explains why advertisements placed in THE FOUNDRY are lasting ads. In this connection we invite comparison with any other trade journal.

Trade Outlook.

That business is far from being dull in this country of ours may be inferred when it is known that pig iron production exceeds a million tons monthly. Although a large volume of business is being transacted, prices are not satisfactory to the majority of producers. One of our contemporaries quotes a recent order for cast iron pipe to have been taken at $16.23 per ton, a price at which the margin of profit must certainly be small, even with the best of shop facilities and management.

It is not likely that prices will be satisfactory for some time to come. We are more or less a nation of kickers, whether times are generally good or bad. The workingman who receives a dollar a day will kick for a quarter advance, and the president of the company will kick in some other direction. Taken altogether, it is probably for our best interests that no one is satisfied. It all sounds very fine on paper to preach that we should be thankful for what we already have. It is all very well to denounce the Anglo-Saxon tendency to upset the calculations of politicians by industrial warfare, yet the fact remains that no one would exchange him for more docile labor. Our kicking has its redeeming features and we should not be occupying our prominent position to-day but for the fact that we are continually looking

for something better, no matter what our relative position may be.

Considerable interest has been manifested by the foundrymen in charcoal iron, which has lately been sold at figures but little above the price of coke irons. The superiority of charcoal iron has always been recognized and only its price has prevented its consumption on a much larger scale.

The malleable iron foundries are simply crowded, and it is almost an everyday occurrence to hear of extensions to old plants, with occasionally a new one going up. Stove foundries report the outlook to be brighter than for years. The New England foundries, have been affected by the shut down by strikes or otherwise of the cotton mills in that section, and business is reported as dull in that quarter. Builders of machine tools, together with locomotive and car shops, continue to find a ready outlet for their products. Agricultural shops are rushed and the farmer appears willing to spend money for new tools to a greater extent than formerly. About the only branch of the foundry trade bordering on a state of inactivity is the pipe foundries.

Whacking a Trust.

The old saying that small thieves are hung while the big ones go free, was never more truly exemplified than in a decision pronounced by the United States Circuit Court of Appeals at Cincinnati February 14, when the so-called "cast iron pipe trust," including half a dozen producers of cast iron pipe, was declared to be an unlawful combination. The court decided that the agreements between the companies were in violation of the common law because in restraint of trade, and that the prices obtained were at times unreasonable. The court concludes that "these water and gas pipes belong to the class of articles monopolies in which are especially disfavored by law."

If we can do so without being in "contempt of court," we would like to say that there is evident need of having a foundryman appointed to the bench, or else having the present occupants take a dose of quinine mixed with horse sense. It is but a few weeks ago that one of the leading eastern pipe foundries went into the hands of receivers on account of the low prices obtained for cast iron pipes since 1893. Elsewhere in this issue we mention the fact of cast iron pipe being delivered in Cleveland for $16.23 per ton. If the honorable judges believe there is money in the manufacture of pipes, we can put them in communication with several plants which will be sold at a bargain.

Of course, we cannot deny that "monopolies in cast iron pipes are especially disfavored by law," because, as is well known, nearly every man, woman and child is compelled to buy cast iron pipe regularly as one of the necessaries of life, while monopolies in sugar, for instance, are all right, for the reason that this article is only contracted for in large quantities by towns and cities.

The court is to be commended for having had the courage to hold up this grasping ocsupus. It is something which entitles it to wear a cast iron medal, cut from some defective pipe. The Foundrymens' Associations should adopt suitable resolutions in memory of such a notable occasion.

Speaking seriously, we do not doubt but what all combinations are against the spirit of the law, but it is somewhat humorous to observe one of the smallest of these receiving the wrath of the judiciary while those controlling the necessities of life are declared to be outside of the reach of the law.

It is difficult to conceive how six pipe works controlling less than half the capacity of all plants could establish excessive prices. The foundry trade is one of the few industries which cannot be cornered. Whenever prices show the least advancement new works are started. In fact, it is one of the few trades in which competition cannot be throttled. Only last week a New England contract for general castings was let at $1.13½ per hundred weight. To meet both ends at such figures it becomes necessary to scratch, and we believe that if the judges who decided that the prices for pipes were excessive were as familiar with the foundry trade as they are with law they would have rendered a different decision.

The cold facts of the case are that a few of the large pipe foundries were engaged—as hundreds of other foundries all over the country are—in trying to sell castings below cost and stay in the business.

Not finding the venture a profitable one they finally agreed—a few of them—on a basis of doing business that would permit them to live while not altogether doing away with the necessary amount of competition.

The details of the arrangement became known to some employe who was afterwards discharged for cause, and in order to get even, or for blackmailing purposes, this employe peddled the information abroad, and finally the district attorney at Chattanooga, seeing an opportunity to add to his reputation, commenced proceedings, with the aforementioned result.

It seems ridiculous that in these days of trusts and combines of every description that openly conduct their business in all directions, an attempt should be made to make an example of something which never existed.

Probably, if it had been an actual fact, the usual steps would have been taken to so protect itself as to keep free of the courts.

Describing Cast Iron Mixtures.

On several occasions we have spoken rather strongly against the common practice of describing a cast iron mixture by the names of the brands of iron entering it and the percentage of each. While certain brands may be fairly uniform, there is still too much variation in the ordinary mixture to permit of it being handled on the plan of a cooking recipe.

Founding would indeed be simplified if results could be reproduced by consulting a compilation of mixtures just as a young housekeeper consults her cook-book. There may appear a certain amount of humor in the way we allude to cast iron mixtures and soda biscuits, but the fact remains that a large percentage of the foundrymen of the country still depend on so-called "mixtures" to furnish them a suitable casting, and that these metallurgical concoctions are determined by the names of the irons instead of by their contents.

We know of but two ways in which an intelligent description can be given of a mixture, and neither of these involves the mention of a name. One of these may be called the chemical description, and includes a complete statement of the amount or percentage in which the different metalloids are present. It is obvious that this cannot be known until after a casting has been used, and it thus happens that one casting becomes a standard by which others are measured, or rather, when a casting is found to be satisfactory it is sought to produce others of a like quality by making them of iron having the same chemical contents.

The other method of describing the mixture which enters a casting may be called the physical description, and consists in measuring a certain sized test bar for shrinkage and expressing this in thousandths of an inch to the foot. Thus, if Smith is making pulleys of a certain kind and obtains satisfactory castings when a half-inch test bar shrinks .116 inch to the foot, it is reasonably sure that you can produce a similar casting of like quality by procuring a mixture having the same shrinkage. Again, we see that, as in the chemical test, one casting becomes a standard by which others are measured.

Elsewhere in this issue appears a letter from one of our correspondents on "Mixtures for Pulley Castings," in which the writer declares that "no man can write a mixture on paper and get good results, unless he is there to grade the iron before it goes into the cupola." With the first part of this expression we are in thorough accord, and have expressed in the first part of this article the only conditions under which a mixture can be put on paper, and these also explain the only methods by which iron can be used intelligently. The writer is somewhat vague as to how he would grade iron before it went into the cupola, even if he was there, though we will say that he would have to employ either a chemist or physical test to determine his procedure.

The curious part of this communication consists in his saying that "no man can write a mixture on paper" and then quoting two mixtures in the same manner which he is criticizing himself. These mixtures represent the average foundryman's method of expressing himself so well that we have chosen them for an example. Three brands of iron are mentioned in one instance and four in another, without a single redeeming feature to tell us what these irons contain. Even the usual numerical designations are missing, and these irons may vary all the way from No. 1 to No. 3, and it would also be interesting to know what difference there is in a machinery shop between "return scrap," made from machinery castings, and machinery scrap.

The "recipe" our correspondent gives for pulley castings may be followed literally and a casting varying widely in physical properties will result. If he had said that he would

use a mixture having a certain chemical composition or one having a certain shrinkage, he would have furnished some information which might have proven of use, but in merely quoting the names of a number of brands he leaves us knowing as little as we did before, and if we happened to obtain a satisfactory pulley casting by following his instructions we should consider it a case of good luck and not judgment.

A Heavyweight.

Just to show the fertility of the nineteenth century it may be mentioned that William T. Brannt, author of "The Metallic Alloys," a practical guide for the manufacture of all kinds of alloys, amalgams and solders used by metal workers, especially by bell founders, bronze workers, tinsmiths, gold and silver workers, dentists, etc., etc., as well as their chemical and physical properties (price $3), is also credited with having produced the following:

"A practical treatise on the manufacture of Vinegar and Acetates, Cider and Fruit Wines," embodying the preservation of fruits and vegetables by canning and evaporation; preparation of fruit, butters, jellies, marmalades, catsups, pickles, mustards, etc." $5.00.

"The Metal Workers' Handy-Book of Receipts and Processes" being a collection of chemical formulas and practical manipulations for the working of all metals, including the decoration and beautifying of articles manufactured therefrom, as well as their preservation." $2.50.

"A Practical Treatise on Animal and Vegetable Fats and Oils," comprising both fixed and volatile oils, their physical and chemical properties and uses, the manner of extracting and refining them and practical rules for testing them; as well as the manufacture of artificial butter, lubricants, including mineral lubricating oils, etc., and on Ozokerite." $7.50.

"A Practical Treatise on the Manufacture of Soap and Candles," based upon the most recent experiences in the practice and science, comprising the chemistry, raw materials, machinery, and utensils and various processes of manufacture, including a great variety of formulas." $7.50.

"A Practical Treatise on the Raw Materials and the Distillation and Rectification of Alcohol, and the preparation of Alcoholic Liquors, Liquers, Cordials, Bitters, etc." $2.50.

It will be noticed that every production of this living encyclopedia is alluded to as being "practical," though it is doubtful if any man can stretch his capacity sufficiently to thoroughly digest such a varied number of subjects. It is an open question whether spread-eagle books of this kind do not accomplish considerable harm, by fixing in the reader's mind as facts, generalities which have no existence in practice.

Krank's Korner.

This is the Krank's Korner. It is not intended that the Krank will at all times say nice things about you. He does not believe in scratching your back because you scratch his. No soft-soaping will be done in this Korner, but if you feel that the matter appearing here does not do you justice, jump on the Krank, he enjoys it, and after you have him flattened out, just call in your neighbors to view the remains.

I have been stepping on the toes of several people lately, and have got no excuse to offer for doing so. Judging from the following, I believe I must have stepped on Bredder Putnam's corns.

A CRANK IN A CORNER.

The "Krank's Korner" of one of our esteemed contemporaries says: "Our friend Putnam said in a recent article that 'pure iron is the desideratum.' If Brother Putnam will secure some wrought iron he will have one of the purest forms of iron, and if he will attempt to melt it and try to make castings therefrom he will find that pure iron is not so much of a 'desideratum' as he would have us believe." Then, this Krank proceeds to inform us as to the functions of the so-called impurities in iron. I do not believe that the editor of the aforesaid esteemed contemporary was turning the Krank in this instance. I do not doubt that I used the words credited to me; they have a familiar sound; and I believe that, if I were to write another article on the subject of malleable iron manufacture it would be just like me to reiterate the statement that "pure iron is the desideratum." It was my good fortune to have the management of a malleable iron plant for a period of years, and I did my utmost to produce pure iron. If it had been in my power to make it even

purer than wrought iron I should have been glad indeed.

The trouble with some "Kranks" is that they slip off the barrel too easily. They speak before they think. They cannot be gravely censured for this—uninterrupted silence would be very trying upon them.—E. H. Putnam in The Tradesman.

All the mean things I have said in the "Krank's Korner" flashed before me as I observed that I was at last cornered. Before reading what Bro. Putnam had to say I thought I was a gone sucker. I could feel him dousing my glim in a way that would effectually end my career as a Krank. However, if I never have a tighter corner to crawl out of than what Bredder Putnam has built around me, I will, as they say on the Bowery, have a pudding.

The Krank is human and very liable to make mistakes, for the straightening out of which he will be thankful. It should not be understood, however, that he is the only Krank, simply because he owns up to being that sort of an individual, nor is he the only one who slips off the barrel. There are also others who speak before they think.

The article of Mr. Putnam's, to which I referred in the December FOUNDRY, is entitled, "Time for Charging the Cupola—Relative to Starting the Blast." As it contains much of value besides the single sentence criticized by me, it is reproduced below:

"Writers on this subject used to advise that the iron lie on the coke bed for an hour, or even two hours, before the blast is applied. They said that this would get the charge well heated through, and that it would have a tendency (one writer said) to anneal the iron!

"The writers were capable foundrymen, and, therefore, their utterances must be respected, whether we indorse them or not. And I, for one, certainly do not indorse them. Pure iron is the desideratum. We cannot produce it in a common practice, but we strive to approximate it as nearly as possible. But if you heat pig iron red hot while it lies on the coke fire, it will very rapidly absorb the sulphur from the coke, and the sulphur will remain in the iron, causing the casting to be made therefrom hard and weak.

"Again: Iron is annealed by being heated very hot and kept at a high temperature for a time, and then being allowed to cool very slowly. This is the simplest process of annealing by heat. It would seem to me to tax the imagination to some extent to believe that iron, kept red hot for an hour or two, then heated to the fusing point and cast, would be annealed by the process.

"I have tried all sorts of plans in melting iron, and I believe the best plan for cupola practice is to charge so soon as the coke is well afire at all the tuyeres and the blaze, or the red glow, may be seen next the walls when looking down the charging door; and so soon as the cupola shall have been filled, apply the blast. In other words, the more quickly the iron goes through the cupola the better will be the product. I do not think that the molten iron takes up impurities so readily as red hot, or 'mushy' iron.

"Sometimes, when a pig of iron is heated red hot on a coke fire, and then removed, the strong sulphur smell is very marked. But this smell is not observed in melted iron. It is possible that the reason for this latter is that the sulphur in melted iron is chemically combined with the iron, and therefore cannot escape. But in the case of the red hot pig, it had certainly been either chemically combined, or else it had been collected and held within the iron mass, so that if the pig, in this surcharged condition, should be heated to the fusing point, it would seem reasonable to suppose that the molten iron would be likewise heavily surcharged with sulphur.

"However this may be, my own experience indicates the propriety of charging the iron so soon as the coke is well afire at all the tuyeres, and then put on the blast when the stock reaches the charging door.

"The important thing is to use the right kind of fuel—dry shavings, dry kindling wood, plenty of it, carefully laid in the cupola so as to insure a good draught everywhere; then light the fire at the tapping hole, and at all the tuyeres also, unless you have so intelligently arranged the fuel as to insure an even draught throughout the whole area of the cupola. Look into the tuyere holes frequently after lighting, till you see a perfect, hot fire everywhere. Then charge and blow as soon as you please."

The Krank is a very ordinary mortal and not gifted with any supernatural power. If the above is an article on "Malleable Iron Manufacture," he is kranky enough to insist that he can't see it that way. If any-

one else considers it a treatise on malleable iron, I would be pleased to have his address. Of course Bro. Putnam may have been thinking about malleable iron all the time he was writing about dry shavings and dry kindling wood, but if such was the case, the malleable part seems to have dried up on him. I do not believed I should be blamed for that. I am no mind reader. I cannot, with my present visionary equipment, see what Bro. Putnam thinks. If I could I am sure I should have some bad dreams. Why does not Bro. Putnam index his after-dinner speeches, instead of compelling me to trace up their source in self-defense?

But for the sake of argument I will condescend to allow my mind to imagine that Bro. Putnam actually had written, "Pure iron is the desideratum," in connection with some enlightenment on malleable iron. What of it? If pure iron is a desideratum in malleable castings, why do the manufacturers vary the percentage of the metalloids to suit the different classes of work? If pure iron is sought, why do they not use the purest iron they can find, irrespective of the kind of castings they have to make? (See "Notes on Malleable Iron," George C. Davis, chemist, Thos. Devlin & Co., THE FOUNDRY, June, 1897, p. 169; "Notes on Malleable Iron," W. H. Kane, THE FOUNDRY, December, 1897, p. 171.) Mr. Putnam must have yanked his ear out of joint when he said that he would like to make iron purer than wrought iron. What would he do with it?

Take away the metalloids, and leave the iron pure, and what is it worth? How many of our needs can we satisfy with pure iron? Decidedly not very many. It would be a handy thing all around if such were possible. Physical tests, chemistry and a whole string of engineering formulas could be done away with. Bro. Putnam's management of a malleable iron plant will indeed be a most fortunate thing for the world at large, if he can demonstrate that pure iron will give us greater service than any other form of iron. When that time comes, the Krank will cheerfully give up the ghost and retire forever to his Korner.

When inferior business methods cause a man to fail he is sure to talk about the tyranny of labor unions, of which his competitors do not complain.

Multiple Molding.

By F. O. FARWELL.

I was very much interested in the description of the Avery Molding Machine and molds shown in the January FOUNDRY, particularly in the molds.

I have been making multiple molds, consisting of double faced mold sections, having the impression of a part pattern on both sides of each section, and compiled one upon the other, forming mold cavities between each mold section.

My method of making the double-faced mold section differs materially from that shown by Mr. Avery, and instead of placing the mold sections on edge and pouring each cavity separate, I place the sections horizontal one on top of the other and pour each multiple mold of several sections through one sprue which extends from the top through each section to the lower level.

The sprue is so constructed that the metal in its downward course will not enter any of the upper or intermediate levels until the lower levels are filled.

In making these mold sections, a sand press with turret top is used. On one side of the turret, one of the pattern plates is secured. On the other side is secured a penning frame which in entering the flask filled with loose sand, presses the sand thoroughly except where the patterns on the upper plate are to be bedded in.

After the surplus sand is struck off, filling the depressions made by the pening head, a thin layer of sand is riddled on top into which the upper patterns are pressed.

The pening head prepares the sand by making it hard around the patterns and leaving it soft where the patterns are to enter so the sand will pack evenly around these, making a sharp, clean impression on both sides of the section.

Fig. 1 shows the machine with flask in position and one section of a mold of sash weights rammed. Now, this section is placed upon the floor upon a bed of riddled sand without a bottom board. Another section is then made in a similar flask and placed upon the first, after which the first flask is removed and used to make a third section and so on, continuing the process of removing the lower flask and leaving the top one remain to guide the next section in place.

After the first section is made, each additional section makes a complete mold.

When it is necessary to have the sprue near the side of the mold, bands are used inside the flask.

Fig. 2 is from a photograph of a multiple mold of eight sections with bands.

Fig. 3 is from a photo of the contents of Fig. 2, which is 28 7-lb. sash weights.

Fig. 4 is from a photograph showing a multiple mold 11 sections high, made in a snap flask with bands.

Fig. 5 is from a photograph of the contents of Fig. 4, which is 60 1½-in. washers.

the runners leading from the sprue to the mold cavities in each level was of the ordinary construction. But by making the runner so they present as large a surface to the sand as possible in proportion to the volume of metal they contain, I find that by the time one level is filled, the runners in the next lower level will have congealed sufficiently to prevent any more metal being forced into it.

This proves that the hight of the mold is not limited by the hydrostatic pressure.

The castings from each section have been weighed separately and found practically

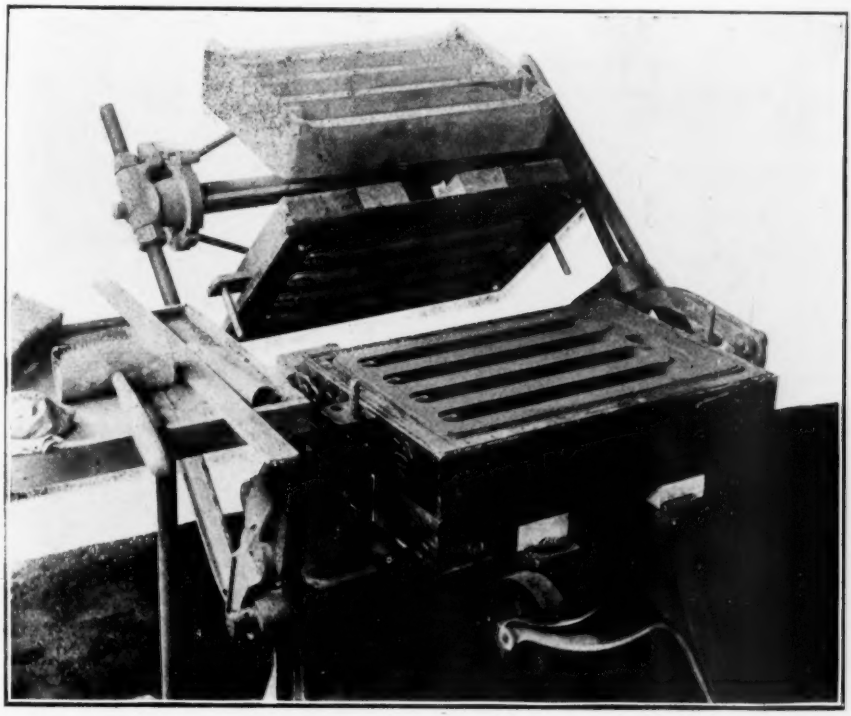


FIG. 1—MULTIPLE MOLDING.

Fig. 6 is from a partly finished multiple mold without bands, the patterns being boiler handles. This was experimental, the intention being to put the same number of patterns on the other side of the gate if it was found that they would run gated this way. The experiment was successful, but the job has not been fitted up yet, for lack of time.

One would imagine that a high mold like this would be impossible, because the hydrostatic pressure would strain the castings in the lower level. This would be the case if the same weight and no strains on any castings.

Of course this mold, when made too high, would be impractical unless poured with a crane ladle.

In general practice, I find molds seven or eight sections high are as high as can be conveniently poured with a bull ladle, carried by hand.

It was the desire to lessen the hard work in pouring a great number of small molds that at first prompted the idea of making multiple molds.

This process will not only show a great saving in pouring, but more molds can be made per day and less floor space and less sand used. Just how wide a range of work can be made by this process is yet to be determined. It is not limited to patterns with one flat surface, for with the use of a sand press with turret top and a pening head, that will pack the sand between the patterns, the upper pattern plate may be bedded or pressed into the loose sand and sharp corners and detail obtained.

The process is simple and the machine used in making these multiple molds is not special, but is a standard sand press with turret top, made by The Adams Company of Dubuque, Iowa.

The photos shown are from some of my first molds, and were made for patent office use. I have since made by this process, molds from patterns of ¾-in. bibb cocks, 1½-in. tees, boiler handles, and several light castings with good results, but have not photos of these jobs at present.

It is the intention in the foundry with which I am connected, to change the jobs that appear to be applicable to this process, as fast as possible.

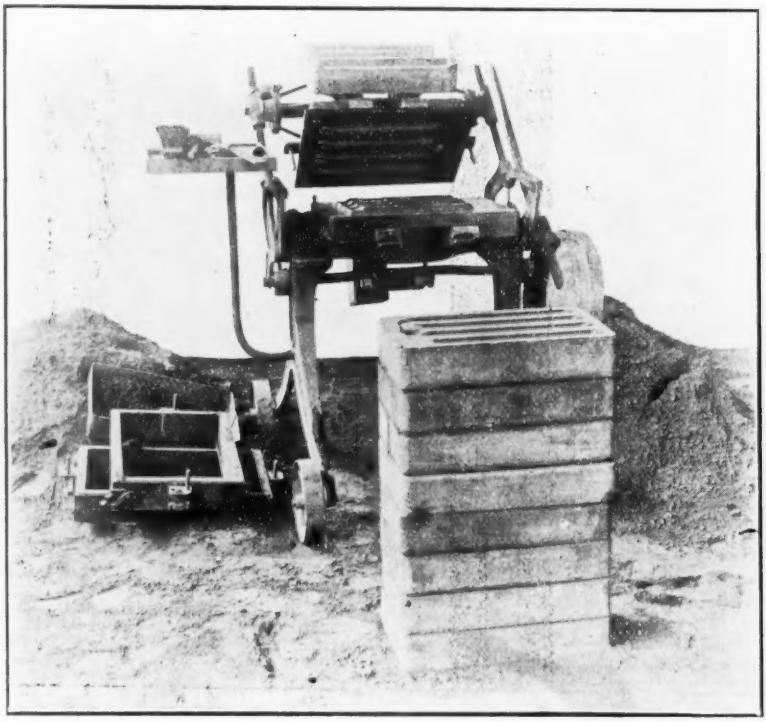


FIG. 2—MULTIPLE MOLDING.

Mechanical Changes in Foundry Mixtures.*

By EUGENE W. SMITH.

In the discussion before the Western Foundrymen's Association in February, 1897, on "What is the proper amount of air, and pressure of same to melt iron in the cupola, and what are the effects of too little or too much air?" the third division of the question was quite thoroughly discussed. The general opinion was that the changes in iron are probably due to mechanical changes. Mr. Dalton attributed hard iron in the first part of the heat to the condition of the cupola. Mr. Pettigrew claimed that the first iron is softer, providing the cupola is dry. If the conditions are constant, why should not the results be the same? Mr. Coffeen supported

*Paper read at the meeting of the Western Foundrymen's Association, Chicago, Feb. 16.

the theory of open cupola and excessive blast pressure, by his statement that he found it necessary to use softeners in the first part of the heat. Mr. Ferguson advocated using all the blast pressure obtainable, but stated that iron is harder at the beginning of the heat. If the mixture is the same, should not the result be attributable to a mechanical condition existing in connection with the cupola?

The deductions obtained at that time by Mr. Carter served to show that the figures given were pretty close as to amount of air required, viz.: Mr. Sorge, 2,500 lbs. of air per ton melted; Mr. Thompson, 3,000 lbs. of air per ton melted; Mr. Hanna, 3,000 lbs. of air per ton melted. Thus we see that the members who were prepared to discuss the amount of air required came very near agreeing.

The members who discussed the effects of blast, practically agreed that there was a difference in the first iron melted, but did not go far enough and find the cause, which the writer thinks might be attributed to some mechanical change, as expressed in this paper.

Mechanical changes which occur in cupola practice often serve to confuse the foundryman who is otherwise very careful as to the charges which he gives to his melter.

Every now and then someone gives a theory to explain why the first iron is harder than the last, and another will give a reason why it is softer. Each demonstrates the matter to his own satisfaction in scientific terms, citing the destruction of silicon, combining of carbon, effect of sulphur, etc., but all this only serves to mystify the ordinary foundryman who has not had the advantage of a college education.

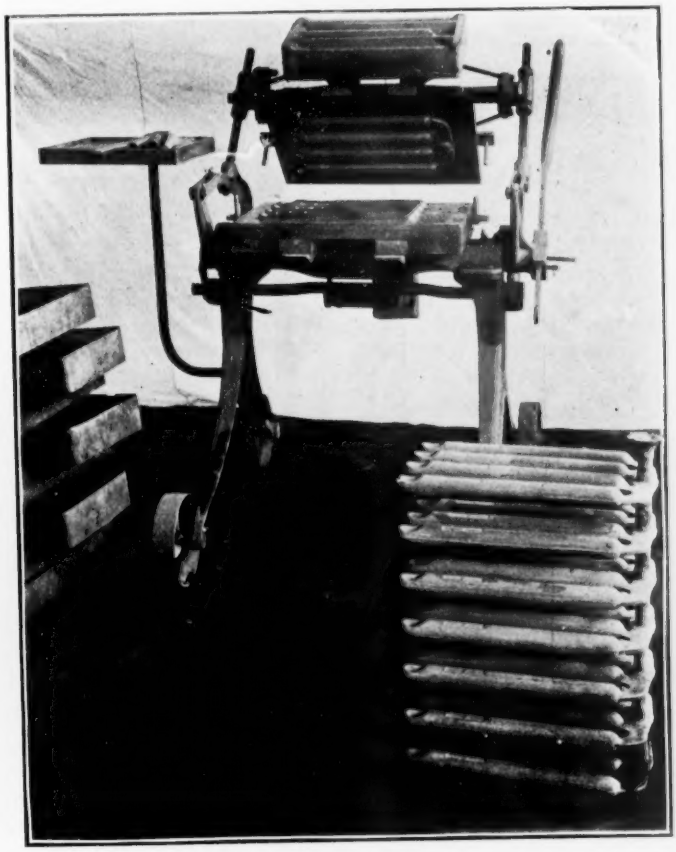


FIG. 3—MULTIPLE MOLDING.

All conditions being equal, results should be the same, no matter at what period of the heat the charge is melted, the differences

being due simply to some mechanical change due to handling. Some of these changes the writer will try to describe in the present paper, showing the absolute care which must be taken in handling to obtain uniform results:

1. A very common source of error occurs in the charging room in weighing up the charges. Sometimes a certain brand of iron is not broken as small as others and the charger is not careful as to balancing his scales, causing variations at different times during the heat.

FIG. 4—MULTIPLE MOLDING.

2. The placing of iron in the cupola in such a manner as to cause uneven melting, allowing one brand to melt and mix ahead of others, frequently causes trouble.

3. Improper drying of the cupola is probably one of the most frequent causes of hard iron in the beginning of the heat, particularly so if the receiving ladle, hand ladles, etc., are not thoroughly dry, or even cold, causing changes in the condition of iron by chilling.

4. Probably the most important cause of change in the first iron melted is the excessive use of blast. The cupola at that time is probably in the very best condition. The fuel resembles an open net-work, somewhat like a sponge, unobstructed by slag, which does not begin to form until considerable iron has been melted. The tuyeres also remain unsealed, and if conditions are otherwise all right, the iron will be exposed to the oxidizing effect of the blast while trickling through the fuel, serving to harden it.

This is generally attributed to a chemical change caused by sulphur in the bed charge of fuel. But there is no good reason why the sulphur should predominate any more in

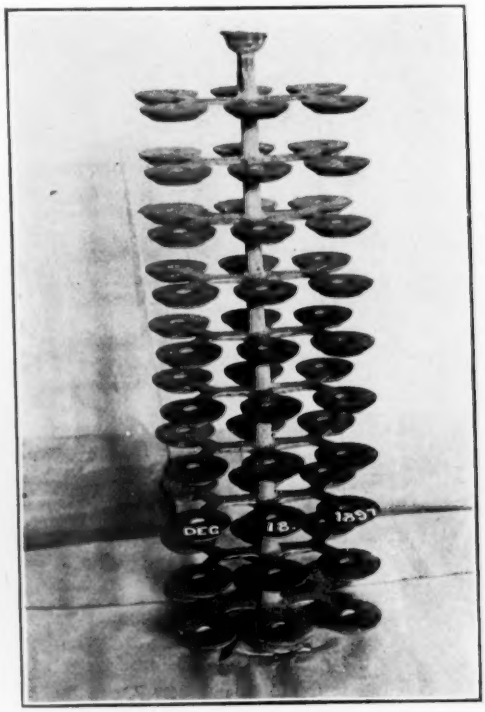


FIG. 5—MULTIPLE MOLDING.

the first charge than later in the heat; or, as is sometimes the case, on one day more than the next, when the same fuel is used. It is also attributed to the destruction of silicon, which is probably the true effect but not the cause. It is simply a condition which should not exist, as the heat required is no greater at that time than later on. True, it is hard to draw the line by calling it a mechanical change when the carbon has been combined no matter by what cause. Still it may be avoided mechanically, where control of the blast may be had, by reducing the pressure to the lowest possible point possible without delaying the melting process.

This trouble is met with in all foundries more or less, except where large amounts of

iron are carried in the cupola. In such cases the effect of blast would not likely be apparent.

5. Another source of error, caused mechanically, occurs when the iron is drawn off faster than it is melting, not allowing it to mix properly, thus obtaining hard iron at one time and soft at another.

6. A change in condition occurs where the slag-hole is used and the cupola is held too full, allowing the slag to clear off the iron, thus exposing it to the oxidizing effect of the blast.

7. Still another change is caused where the lining of the cupola has been made too

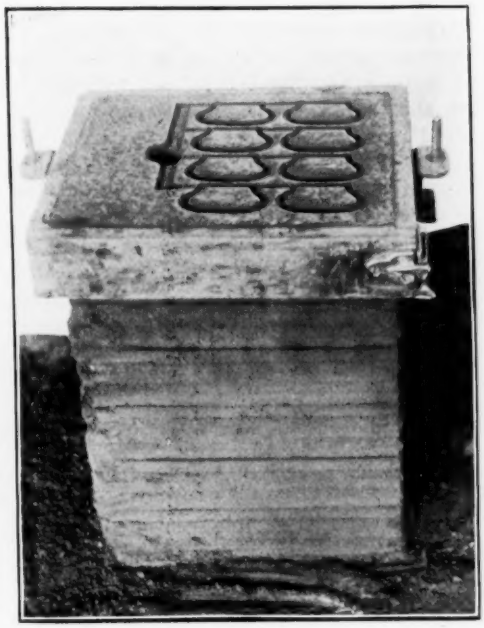


FIG. 6—MULTIPLE MOLDING.

hot in drying out, which sets fire to the fuel charges above the melting zone at one side or the other, causing the stock to come down unevenly.

8. Very often the tuyeres are formed unevenly, with larger openings on one side than the other, causing the stock to melt faster on one side, thus giving an uneven result.

Another instance occurs where economy in the use of fuel is practiced. The bed may be all right and heat started successfully, but by the excessive use of blast the bed of fuel is gradually decreased, until at last, when charging is all done and the doors closed, the iron melts too close to the tuyeres, which is almost invariably a cause of hard iron. Soft fuel under the same conditions would likely have the same result. In the above case an excess of thin fluid slag, about the consistency of soapsuds, will be noticed, very foamy and light; and if the blast is excessive, the slag will be held up by its pressure around the sides of the cupola, also giving off a peculiar puffing sound very easily noticed. It cannot be drawn off until the blast pressure has been reduced, which must be done gradually and carefully, or the slag will flow into the tuyeres first. The hard iron in this case could be attributed to the destruction of the metalloids, nevertheless it is a mechanical change in the mixture which would not have happened if the melting had been done properly.

The above items only apply when the iron melted does not exceed eight tons per hour and the stack does not exceed 48 inches diameter. Neither do they apply to any particular grade of mixture. The effects would probably be the same, whether hard or soft irons were melted.

Pittsburg Foundrymen's Association.

At the January meeting of this association, Thos. D. West presented two papers, entitled, "Oxidation of Foundry Metals," and "Effects of Phosphorous on the Strength and Fusibility of Iron." In the first one Mr. West describes some experiments he made in a specially constructed cupola to determine the loss of metal by oxidation when melting sandless pig iron. Some furnaces having discarded the ordinary method of casting pig iron in sand beds and substituted therefor chill molds, the question has been raised that there is a greater loss by oxidation with this metal, owing to the absence of sand or scale to form a slag and thus protect the metal. Mr. West prefaces his paper with the following remarks:

"The amount of iron lost by melting is as important an item to study in these days of sharp competition as that of any other material necessarily destroyed in the making of castings. Many founders endeavor to keep a close record of such losses; but there are many that cannot. Founders that can clean up every day's 'heat' of castings and collect in all fine shot, scrap and gates daily, are in the best position to attain the greatest accuracy in such records. Take shops that have castings lying in the sand

from one to six days or more before they can be removed or cleaned up, they find the task a much more difficult one. Shops of this latter type may endeavor, every six months or year, to average their total losses of the different irons used; but apart from their inability to know what the loss on any special iron or scrap may be, they cannot feel thoroughly confident in the correctness of their total losses. Shop tools are cast almost daily for themselves, and to make any attempt at keeping their weights would be costly. And, again, more or less fine scrap gets buried up or carried away in such shops.

"Did pig and scrap iron always come clean to the founder's yard then shops not in a position to have confidence in their own records could often be fairly guided by what they could learn of others better placed to collect reliable data.

"In buying pig iron the furnacemen allow us 268 pounds per ton for scale and sand. How much of this 268 pounds is actual refuse no one can determine accurately. Thus another obstacle arises. When I first learned that there was a strong possibility of chilled or sandless pig replacing sand-cast pig, one of the first thoughts that came to my mind was that the founder would at least be placed in a better position to know what iron he was actually receiving from the furnace, or in other words, what percentage of the weight charged to him was actual sand or iron.

"In first studying up the casting of pig metal in chills, I could not see anything unfavorable to the universal adoption by founders and steel makers of metal so cast. Mr. Howard H. Hooker made the claim that a greater loss would be incurred by the use of sandless pig than by that having sand scale on it, which was said to afford a protection to the iron against oxidation, or being burned away while being brought to a liquid state. I have no knowledge of the process by which Mr. Hooker has arrived at his conclusions; I can only say that to obtain definite proof that more iron is lost by using chilled than sand-coated pig metal steps that differ from general practice are necessary."

After reciting in detail the methods employed, together with a tabulated report of all the experiments, the author concludes:

"Another interesting point, which may surprise many, is that the slag which came from stove-plate iron had a less percentage of iron in it than that which came from the heavier or sandless gray roll iron. While this is shown as such, it does not imply that there is a less total loss of iron with stove plate than with heavier iron, as we know by actual practice the reverse to be true. That there is a greater loss of iron by smelting stove plate than is found in heavier irons is due to the films of oxide or scales of rust and dirt, which, when attacked by the high temperature of a cupola in blast, either go to make extra slag or escape out of the stack in other forms. This phenomena in slag production is exhibited in actual practice whenever we melt dirty or burnt iron, as all founders well know.

The facts presented herewith suggest that opinions of the past in regard to oxidation of metal are in many cases not well founded, and that where losses of iron have been attributed to oxidation of the metallic iron proper, or a reduction of the metalloids, proper account has not been taken of the dirt, rust or films of oxide that might have coated the pig or scrap iron used. We are led to conclude that if it were possible for us to secure clean iron, free of all sand or rust, the loss of metallic iron due to oxidation, is not as large as has been generally supposed."

In his second paper, dealing with the effects of phosphorus, Mr. West found that a slight addition of this element materially increased the strength of the iron.

The Uses of the Blower in the Foundry.*

By WALTER B. SNOW.

Under the broad term blower may be classed four types of machines, differing widely in their construction and operation.

1. The peripheral discharge fan wheel with inclosing case.

2. The propeller or disk wheel, discharging its air in lines practically parallel to its axis.

3. The so called rotary blower with close fitting revolving propellers, and

4. The blowing engine, acting upon the principle of the plunger pump, and capable of producing pressures of several pounds to the square inch.

Of these four types, the second, or propel-

*Paper read by the author before the New England Foundrymen's Association.

ler type, is absolutely valueless for cupola work, because of its inability to produce the required air pressure; while the fourth, or blowing engine type, is too complicated and expensive for use in the ordinary foundry. For all purposes, except blowing cupolas, the fan blower is the only type which is adaptable. Although the rotary blower is to a certain extent employed for this specific purpose, a clear statement regarding the theory and operation of the fan blower, such as it is here attempted to make, should render evident the predominant advantages of the latter type.

According to the purpose for which they are designed, fan blowers may be classed either as volume blowers or pressure blowers, although one type naturally merges into the other. In either type the fan blower proper consists in its simplest form of a number of blades extending radially, or nearly so, from its axis and presenting practically flat surfaces to the air as they revolve. By the action of the wheel the air is drawn in axially at the center and delivered from the tips of the blades in a tangential direction. It is therefore designated as a centrifugal fan, or, more properly, as a peripheral discharge fan.

A volume blower is primarily designed to discharge air in large quantity under low pressure with the minimum expenditure of power. This requires a wide and comparatively slow running wheel. A pressure blower, on the other hand, is designed for the purpose of creating a high pressure, which may be as great as 20 ounces per square inch, while delivering a relatively small volume of air. To this end the wheel must be narrow and operated at high speed.

In operation the peripheral discharge fan sets in motion the air within it, which, acting by centrifugal force, is delivered tangentially at the outer circumference of the wheel. Air rushes in at the axial inlet to fill the space between the blades, in which there is, by the centrifugal action, a tendency to form a vacuum. The degree of this vacuum is dependent upon the circumferential speed of the wheel; and the velocity of the air discharged through an outlet of proper size is substantially equal to that of the circumference of the wheel. The fan case thus virtually becomes a reservoir from which the air escapes through the outlet, the proper size of which to produce the above stated results will be discussed further on.

In the attempt to force air at a given velocity through a given pipe, it is the province of the fan wheel, if employed therefor, to create within the fan case a total pressure above the atmosphere which shall be sufficient to produce the velocity and also overcome the resistance of the case and the pipe. If, however, the pipe be removed and the fan be allowed to discharge the air through a short and properly shaped outlet the pressure necessary will, with an efficient fan, be substantially that required to produce the velocity. The velocity of the fan tips or circumference of the fan ~~the fan tips or circumference of the fan~~ wheel which is necessary to produce a given velocity of flow through a properly shaped outlet within the capacity of the fan is substantially equal to the velocity of flow. If, therefore, the peripheral velocity of a given fan is known, the resulting pressure for the production of velocity through an outlet of proper size and shape may be readily calculated.

The pressure created by a given fan varies as the square of its speed. That is doubling the speed increases the pressure fourfold. The volume of air delivered is, however, practically constant per revolution, and therefore is directly proportional to the speed.

The work done by a fan in moving air is represented by the distance through which the total pressure is exerted in a given time. As ordinarily expressed in foot pounds, the work per second would, therefore, be the product of the velocity of the air in feet per second, the pressure in pounds per square foot, and the effective area in square feet over which the pressure is exerted.

From this it is evident that the work done varies as the cube of the velocity, or, as the cube of the revolutions of the fan. That is, eight times the power is required at twice the speed. The reason is evident in the fact that the pressure increases as the square of the velocity, while the velocity itself coincidently increases; hence the product of these two factors of the power required is indicated by the cube of the velocity.

In selecting a fan the facts just presented should be borne in mind. It appears to be

so simple to secure increased volume by running a given fan at higher speed that the influence upon the power required is frequently overlooked. If the necessary amount of power is actually furnished, its expenditure will entail great loss in efficiency as compared with that required to operate a fan properly proportioned to the work.

In the design of a wheel to meet given requirements it is necessary to make its peripheral speed such as to create the desired pressure, and then to so proportion its width as to provide for the required air volume. Evidently the velocity and corresponding pressure may be obtained either with a small wheel running at high speed or a large wheel running at low speed. But if the diameter of the wheel be taken too small it may be impossible to adopt a width, within reasonable limits, which will permit of the passage of the necessary amount of air under the desired pressure. Under this condition it will be necessary to run the fan at higher speed in order to obtain the desired volume. But this results in raising the pressure above that desired, and in unnecessarily increasing the power required. On the other hand, if the wheel be made of excessive diameter it will become more impracticable on account of its narrowness. Between these two extremes a diameter must be intelligently adopted that will give the best proportions for the specific work it is designed to do.

The actual work which a fan may accomplish must depend not only on its proportions, but upon the conditions of its operation and the resistances which are to be overcome. Evidently, it is improper to compare fans when operating under such conditions that these resistances cannot be definitely determined. The simplest and most natural condition of operation is that in which the fan is operated without other resistance than that of the case—that is, with open inlet and outlet. For proper comparison of different fans, the areas through which the air is discharged should bear some constant relation to the dimensions of the wheels themselves.

It has been determined experimentally that a peripheral discharge fan, if inclosed in a case, has the ability, if driven at a certain speed, to maintain the pressure corresponding to its tip velocity over an effective area which is usually denominated the square inches of blast. This area is the limit of its capacity to maintain the given pressure. If it be increased the pressure will be reduced, but if decreased the pressure will remain the same. As fan housings are usually constructed, this area is considerably less than that of either the regular inlet or outlet. It, therefore, becomes necessary, in comparing fans upon this basis, to provide either the inlet or the outlet with a special temporary orifice of the requisite area and proper shape, and make proper correction for the contracted vein. The fan is thus, in a sense, placed in a condition of restriction of discharge, which it approaches in practice only in so far as the resistance of pipes, passages and material through which the air must pass have the effect of reducing the free inlet or outlet of the fan.

Although the theoretical considerations which govern the design of fans have here been given, the conditions which exist in any given case must enter into any decision as to the practical dimensions to be given the fan. If volume alone, regardless of pressure, is the requisite, the larger the fan the less the power required. There is a strong temptation, however, for a purchaser to buy a smaller fan and run it at a higher speed; for he sees only the first cost and does not realize the entailed expenditure for extra power. If possible a fan should never be made so small that it is necessary to run it above the required pressure in order to deliver the necessary volume. To double the volume under such conditions requires eight times the power. Three times the volume demands 27 times the power.

For certain purposes, such as the blowing of cupola furnaces, a comparatively small volume of air is required, but under high pressure. For exhausting, blowing boiler fires and the like, the volume required is greater and the pressure relatively less. The former wheel requires to be narrow at the circumference, thus providing for the escape of only a small amount of air. When a fan is employed for exhausting hot air or gases, the speed required to maintain a given pressure difference is evidently greater than that necessary when cold air is handled, the difference being due, and inversely proportional to the absolute temperature.

We may now turn to the different types of fan blowers employed in the foundry and

consider them in a somewhat more practical manner. First of all is the pressure blower, for blowing the cupola, so familiar to you in the form of the Sturtevant steel pressure blower. The extreme length of the bearings and the special arrangement for keeping them well supplied with oil are among the most important features which have made possible the continued employment of blowers of this make for fully a third of a century with practically and in many cases with absolutely no expense for repairs. The fan wheel is narrow, with tapering sides, reducing to the minimum width at the outer circumference where the air escapes from the wheel into the surrounding case. Numerous curved blades or floats serve, by their continuous action, to prevent the return of this air to the wheel center and thereby maintain the pressure due to their tip velocity. From what has previously been said, it must be evident that even a slight change in the width of the tip of the blade of such a narrow wheel must have a marked effect upon the volume of air which is discharged and upon the power which is required to accomplish this result. For this reason blowers cannot be compared by the areas of their casing outlets, but only by their capacity areas, as determined by the proportions of the wheels.

The general application of a pressure blower to a cupola is too well known to require description, but certain features which relate to its efficiency may well be considered here. The proportions of a pressure blower wheel should theoretically be such that its capacity area or square inches of blast shall be practically equal to the free area through the fuel and iron in the cupola, less the influence of the resistances of piping, tuyere boxes, fuel and iron. These resistances are evidently the equivalent of just so much reduction in area, and must therefore enter into any consideration. But it is manifestly true that differences in the length and arrangement of piping in different plants and of size, quantity and character of the charges in the same plant, introduce such variable conditions that it is impossible to design a blower of any type that shall at all times be just exactly proportioned to the work to be done. For this reason the exact power required to operate any given blower cannot be given as an absolute quantity, but can only be determined when all of the conditions are known. It is, or at least it should be, customary in specifying the pressure required to operate a cupola, to refer to that in the wind box. On the other hand, the table of blower speeds presented in the Sturtevant catalogue gives the number of revolutions necessary to produce the given pressure at the fan outlet when its area is within the capacity of the blowers. Owing to losses due to transmission, this pressure cannot be maintained at any more or less distant point, such as the wind box of the cupola, unless the speed of the fan is increased sufficiently to produce an excess of pressure equal to the transmission loss. It is the failure on the part of the purchaser to comprehend this fact and to make due allowance for transmission losses, that sometimes results in too low a pressure at the cupola, and an unjust charge against the blower. Large, straight and short connections from blower to cupola are always imperative if waste of power is to be avoided. If changes in the direction of the piping are necessary, they should be made with as large a radius of curvature as possible. It should be distinctly understood that the power required to operate a fan blower is proportional to the area of discharge. If this area be reduced to zero by the closing of the blast gate, the power will be reduced to merely that due to the friction of the machine and of the air confined within the case. Too often it is claimed by those who ought to know better, that closing the pipe increases the power, but as power is expended only when air is moved, the fallacy of this statement is evident. This fact points to one of the prominent economic advantages of the fan blower, viz., its automatic action. Instead of always delivering a fixed volume of air, regardless of requirements, the fan blower automatically increases the volume as the resistances are decreased. On the other hand, if the fan blower be in operation with a fairly free outlet, in excess of its capacity area, and that free area be decreased, the pressure produced by the fan will immediately rise, thus tending at once to overcome the increased resistance. Therefore, if a certain maximum pressure is known to be required in a given cupola, the fan may be so speeded as to give this at such times as the conditions demand. While at other times, when less pressure or volume

of air is required in the cupola, proper manipulation of the blast gate will economize power. Compared with a type of blower like the rotary, in which a certain maximum pressure and volume must always be maintained, and a portion allowed to waste if not required, the economic advantage of the fan blower is evident.

In the matter of first cost the fan blower is, for the same capacity, only about one-quarter as expensive as the rotary blower and weighs on the average only about one-ninth as much. This latter feature is of the greatest importance, particularly in the case of large plants. For with the fan blower expensive foundations and high freight charges are avoided, while the handling of parts for repairs is rendered far easier. In the matter of efficiency under the same conditions, the fan blower has been shown by impartial experiment to be superior, while in general endurance, in lack of danger of breakage and of leakage due to wear, it may be fairly claimed to take the lead.

We may now turn to other uses of the fan blower in the foundry—uses in which it has no practical competitor. Employed as an exhaust fan and properly designed for its work, it has found an extended application for removing the dust from tumbling barrels, from emery wheels, and, in fact, for exhausting dust, smoke or objectionable gases from any machine or apartment in which they are generated. For such work the fan is driven at comparatively low speed and proper connection made to the space or spaces from which the objectionable matter is to be drawn. This passes through the fan and thence to any desired place of deposit and is discharged into the open atmosphere.

In the case of the pattern shop, which usually forms an adjunct of the foundry, a fan of this type in the form of a planing mill exhauster is always of advantage for the removal of shavings and sawdust. The width of the wheel in such a fan is far greater both at inlet and outlet than that of a pressure blower wheel. A large volume of air at comparatively low pressure is thus passed through the fan with a minimum expenditure of power.

A similar type of fan on a larger scale is used in connection with a steam pipe heater for the heating and ventilation of the model foundry. By the concentration of all of the pipe in a single heater across which large volumes of air are caused to pass, the amount of pipe is reduced to from one-third to one-fifth of that which would be required, if it were strung around the foundry, as in the case of direct radiation. This concentration of the heating surface also serves to reduce to a minimum all possibility of freezing, renders the regulation of temperature as simple as is possible, and presents numerous other advantages. The heated air is distributed by means of the fan through a more or less extended system of underground ducts with vertical wall flues or of overhead galvanized iron piping. The large quantity of air thus supplied secures adequate ventilation, causes all air leakage to be outward and serves to keep the foundry comfortable and clear of gas and steam during the heat, if cool or slightly tempered air be then supplied.

A similar form of apparatus, designed to deliver air at high temperature, may be employed for keeping cores dry. It is used for drying flask and pattern lumber, when the quantity is sufficient to warrant the arrangement.

Although the boiler plant in connection with an independent foundry is usually of somewhat limited size, nevertheless the fact should not be overlooked that the fan blower is rapidly usurping the place of the chimney in the production of draft or serving as its assistant in securing desired results. Applied to force the air into a closed ash pit it creates a pressure which makes possible a high combustion rate, the burning of cheap fuel and the attainment of the maximum capacity of the boilers. Employed as an exhauster, through which the gases are drawn, it in addition does away with the necessity of a high chimney. Under either form of application perfect control may be maintained over the draft pressure, and it may be automatically increased or decreased coincidently with a slight fall or rise in the steam pressure, which thus remains almost absolutely constant.

Such, then, are some of the uses of the fan blower in the foundry. Either as a convenience or as a necessity it is ever in demand, and its forms of application are constantly increasing. It therefore stands to-day as a specific type of machine whose general advantages and peculiar adaptability are becoming more and more familiar to every manufacturer and engineer.

CORRESPONDENCE.

MIXTURE FOR MOLD BOARDS.

Editor FOUNDRY: In answer to C. A. W., who asks for a mixture of iron for mold boards which will make them as hard as chilled boards, I would recommend the use of good No. 1 stove plate scrap, mixed with old horse shoes, or any kind of wrought iron, 100 lbs. of wrought iron to 1,000 lbs. of scrap. This will not only make the iron hard, but it will also make it strong and tough, and a mold board made from this material will wear well.

DAVID SPENCE,
Foreman Demorest Mnfg. Co.
Williamsport, Pa.

MIXTURES FOR PULLEY CASTINGS.

Editor THE FOUNDRY:

In your February issue a question appears in "Cast Iron Notes" concerning a suitable mixture for pulley castings, stating that aluminum has been used in an effort to obtain a strong and at the same time soft casting, but that no apparent benefit has been derived from its use. For two years I traveled for the Mullins Silicated Iron & Steel Co., of Chicago, mixing iron, and during that time operated in some of the largest shops in the country. Aluminum, used by itself in connection with cast iron, is of but little value, and silicon will accomplish the same purpose. To receive practical benefit from aluminum it should be used in the form of aluminum alloy composite. (We do not quite understand what our correspondent means by this term, unless he refers to some special preparation of aluminum.—Ed.) Together with this should be added a certain percentage of wrought iron to the charges in the cupola, when the aluminum will act as an alloy to both grey and wrought iron, and the results will be superior to those obtained with aluminum only.

Regarding a mixture for pulleys or other castings requiring special iron, I will defy any man to write it on paper and get good results, unless he is there to grade his iron before it goes in the cupola, as I know from experience that I never got two lots of iron alike from the same furnace, and I am sure there is no two pieces of scrap alike. I have heard foremen order their cupola tenders to put a certain weight of old car wheel scrap in some mixtures, and then blame the cupola tender because these mixtures did not remain uniform day after day. If these same foremen would have gone out into the yard and graded those wheels as they were being broken up, or if they had examined the amount of chill they carried and made their mixtures accordingly, there would have been no difficulty in obtaining the results anticipated, which did not materialize because the amount of chilled iron in a car wheel differs.

In 1889 I was operating in a foundry in Milwaukee, where they were using considerable charcoal iron and thought it impossible to get along without it. About that time the price of charcoal iron went upwards and the firm had contracted for a large amount for future delivery which the furnacemen were unable to deliver, and begged to be released from their contract. After I had demonstrated to the firm that they could get as good results without charcoal iron as with it, they released the furnaces and cleared several thousand dollars without touching a piece of that iron, doing so solely by making tests every day and keeping a correct record of the results.

For fluxing purposes I am a strong believer in fluor spar. Lime, limestone, marble and oyster shells make good active fluxes, but beyond question they are hurtful to the iron, as they carry a certain amount of phosphorus, which greedily attacks the iron and renders the metal hard and brittle. These fluxes also carry away part of the iron in the slag and are altogether dirty and cumbersome, though cheap and convenient fluxes, while with fluor spar the evil influences of the calcium are counteracted in the bath by the fluorine reactions.

Returning to mixtures for pulley castings, I will give two which I believe will be safe. For light pulleys I would use the following brands: Hamilton, 600 pounds; Todd, 400 pounds; Cherry Valley, 200 pounds; return scrap, 800 pounds. For medium sized pulleys I would use a mixture composed as follows: Hamilton, 400 pounds; Todd, 300 pounds; Cherry Valley, 200 pounds, Franklin, 100 pounds; machinery scrap, 1,000 pounds. With a personal examination of the requirements I might change this considerably and substitute other brands on hand.

Boston, Mass. E. J. JORDAN.

SUGGESTIONS FOR FOUNDRY CONSTRUCTION.

Editor of THE FOUNDRY:

In reply to B. & S., in your January issue, would say that my idea would be that in-

stead of having a shop 150x50, I would make it 125x50—that is, the main body of the building 50 feet wide and about 10 feet higher than the wings, which should be 37½ feet wide and run each side the entire length of the building. The advantages of this plan are that you get better light without having to use skylights, which are a source of annoyance. Second, the building costs very much less. Third, the cranes running the entire length of the works are only 50 feet span, which I consider the best working length for a traveling crane. The wings can be used for the lighter class of work with small compressed air hoists or cranes, at convenient distances. I would suggest using both steam and electric cranes for the 50 foot span, so that if anything happens to the dynamos you have the steam. My reason for having the small cranes of the compressed air pattern is that the same engine that supplies air for the sand blast for cleaning castings will also supply the hoists. I would use iron supports and rafters with corrugated glass for main roof and gravel roofing for the wings. The columns that support the crane tracks also support the roof. The walls to be of brick and glass.

Once painting of the iron work lasts for years, as the dust protects from rust. The cupolas I would place in one wing about 75 feet from end of building, with the ovens ranged close to the cupolas. My idea of having the cupolas at one end of building is to facilitate the pouring, which should be done by a separate gang of men, who can also remove the castings on cars, place the flasks where they belong, cut up and temper the sand and have it ready for the molder.

The stock should be carried from the yard up an incline to scaffold by small cars drawn by electric power. B.

FACINGS FOR BRASS CASTINGS.

What is considered the best methods of facing and cleaning castings made from brass?

S. WILSON.

MOLDING ROPE WHEELS.

One of our subscribers asks us to tell him the best and cheapest way of molding rope wheels. We believe some of our readers know more about this subject than we do, and we shall be glad to give space to their ideas. Rough sketches will be acceptable, chalk drawings on a bottom board included.

Among the Foundries.

A new foundry is being built at Orestes, Ind.

Heintz Bros. will erect a new foundry at Portland, Oregon.

S. D. Nevins has purchased the Lowville (N. Y.) Iron Works.

Gundlach & Rompel will establish a new foundry at Belleville, Ill.

The Putnam Machine Tool Co. are erecting a new foundry at Portland, Pa.

William Goldberg has purchased the Glover Foundry, at New Castle, Pa.

The Thompson & Francis Stove Foundry has been incorporated at Gallipolis, O.

The Monroe (Wis.) Foundry & Machine Co.'s plant has been purchased by A. Lanz & Sons.

There was a small fire in the foundry of the Buckeye Engine Co. at Salem, Ohio, recently.

The Oshawa Stove Foundry, at Oshawa, Ontario, is being equipped with new machinery.

The Atlantic Foundry Co. has been incorporated at Cleveland, O., with a capital of $10,000.

There was a small fire in the foundry of the Illinois Malleable Iron Co., at Chicago, February 4.

The General Electric Co. is reported as intending to build a large foundry at Schenectady, N. Y.

J. C. Griffith has purchased the foundry hitherto operated by Griffith & Balch, at Anamosa, Iowa.

A. R. Sauerwein has accepted a position as foreman with the Belleville Stove Works, Belleville, Ill.

Isaac R. Pippin has purchased the foundry at Easton, Md., formerly operated by L. Whitehouse.

The plant of the La Tourette Machine Co., at Middletown, Ohio, has been purchased by Blair, Shartle & Co.

The plant of the Mechanics' Foundry Co., at Rockford, Ill., was burned January 31. It will rebuild at once.

The Parlin & Orendorff Co., of Canton, Ill., are preparing plans for the erection of a malleable iron foundry.

Green, Glover & Co. have purchased the plant at New Castle, Pa., hitherto operated by the Glover Foundry Co.

The R. E. Parsons Co.'s pattern shop at Bridgeport, Ct., was visited by fire January 29. Loss confined to patterns.

The Berlin Iron Bridge Co. are erecting a new building for the Benjamin, Atha & Illingworth Co. at Harrison, N. J.

The American Bronze Foundry Co. has been incorporated at Chicago by Paul Cornell, Jr., Julius Bercham and J. A. Graves.

Stephen Thomas and Sherman Rutan have purchased the foundry at Albion, Ind., formerly operated by Baughman Bros.

J. J. Seay has organized a company at Rome, Ga., with a capital stock of $20,000, which intends to erect a foundry at that place.

In our last issue we mentioned the Exeter Machine Co. as erecting a new foundry at Littleton, Pa. This should have read Pittston, Pa.

An explosion of natural gas in the works of the Dayton (Ohio) Malleable Iron Works injured three men and slightly damaged surrounding property.

At Anderson, Ind., the Richard Thomas Brass Foundry Co. has been organized. The stockholders are Richard Thomas, T. J. Morgan and Alexander Jones.

H. W. Hathorn has purchased the entire stock of the Hathorn Foundry & Machine Co., at Mason City, Iowa, and will continue the operation of the works.

The National Malleable Casting Co., of Toledo, O., is building a 450x82 feet addition to its plant. The new building will be used exclusively for floor molding.

The foundry of the Dain Mfg. Co., at Carrollton, Mo., was entirely destroyed by fire January 31. Loss $8,000, covered by insurance. It will be rebuilt immediately.

The Tioga Foundry Co. has been chartered at Philadelphia, with a capital of $25,000. Incorporators, Samuel A. Kensil, Lewis T. Matlack, Walter L. Taylor, Jacob B. Blankley, Helen B. Way.

The big foundry belonging to the Hooven, Owens & Rentschler Co., in Hamilton, Ohio, burned January 26, causing a loss of from $15,000 to $20,000. The pattern shop and offices were saved.

The Vulcan Iron Works, one of Chicago's oldest foundries, was burned to the ground February 5. It was erected in 1861, and the loss consists chiefly of patterns, which were stored in the building.

John D. Ansley, formerly connected with the Condor Iron Foundry Co., of Boston, has purchased the plant at one time occupied by the G. W. Bent Mfg. Co., and will operate the same as a general foundry.

The Illinois Steel Co. has commenced the construction of a one-story foundry on Eighty-ninth street, east of the Strand, Chicago. It will extend over an area of 55x110 feet, and will be constructed of brick and stone.

Another malleable iron foundry is projected at Racine, Wis. T. T. Wood, former superintendent of the Belle City Malleable Iron Works, is reported to be interested. The plans contemplate a large sized establishment.

E. J. Sherwin has sold his interest in the Enterprise Foundry Co., at Muskegon, Mich., to W. B. McLaughlin and has retired from business. The concern is now owned by P. J. Martin, W. B. McLaughlin and J. C. McLaughlin.

The Flush Tank Co. and the Aurora Iron Works, both of Aurora, Ill., have consolidated under the name of the Flush Tank Co., with a capital of $50,000. The new company will carry on the business formerly conducted by the old corporations.

The Eclipse Foundry, Cleveland, owned by Thomas, Joseph and Andrew McBeth, and Chas. Kelly, and making a specialty of architectural castings, was badly damaged by fire January 23. The plant was practically destroyed, though the walls are intact.

The Chambersburg Engineering Co. succeeds the Taylor Engine Co. at Chambersburg, Pa. Wm. H. Derbyshire is president of the new company, which, besides putting a line of engines of its own on the market, is also prepared to furnish repairs for engines built by the Taylor Engine Co.

J. B. & J. M. Cornell, of Twenty-sixth street and Eleventh avenue, New York, turned out last week at their Cold Spring Foundry a perfect casting weighing 22 tons, for an engine cylinder, and have booked orders for a large tonnage of heavy sugar-making and other machinery castings.

This firm has taken over the old West Point Foundry, and are thoroughly remodeling and modernizing the plant; within the next thirty days they will have completed the increase of the cupola melting capacity to sixty (60) tons per hour, and in addition to this have two large air furnaces. Adding this capacity to their New York City plant puts them in the front rank as producers of general iron castings.

W. C. Beach, representative of Pawling & Harnischfeger, of Milwaukee, Wis., has just installed two large traveling cranes in the plant of the La Belle Iron Works, Wheeling. The cranes are of a special make and will be of the three-motor electric type. One is of five tons capacity, with a 75 foot span, and the other of 20 tons capacity, with a 50 foot span.

Farrar & Treffts, proprietors of the East Buffalo (N. Y.) Iron Works, have decided to enlarge their plant. A new building is to be erected, a traveling crane, capable of lifting 25 tons, is to be put in and other improvements made which are designed to make the plant a modern one in every way. The new structure is to be of steel and brick and will have a frontage of 80 feet and 120 feet deep.

Col. James A. Sexton, for over a quarter of a century in the stove business, and a member of the firm of Cribben, Sexton & Co., of Chicago, has retired to private life after a most successful career, selling his interest in the stove concern to Henry Cribben, William H. Cribben, Joseph M. Sexton and Dwight H. Truesdale, who have incorporated the Cribben & Sexton Co., capitalized at $300,000.

The Whiteley Malleable Castings Co. of Muncie, Ind., have made some very extensive improvements in their plant and are now making an extension to their annealing department 200 feet long, by 76 feet wide, putting in 6 large additional ovens which gives them a capacity of melting and annealing 100 tons per day. They have also added a blast system to their annealing ovens, which enables them to save about 50 hours of firing. Their work at present is largely automatic car couplers, and agricultural implement work. They are making the following automatic M. C. B. couplers, the Hein, Foster, Washburn, St. Louis and National. All departments of their factory have been running overtime for the past 90 days, employing about 600 men. The natural gas still holds up as strong as ever in that region and they are using it for melting all of their iron, annealing, etc. They are also using it in generating motive power for hoists in place of air, and for all steam, heating and light purposes.

The Lynchburg Brass Manufacturing Co., of Lynchburg, Va., makers of fine brass and bronze castings, have recently made extensive improvements in their plant. The Brass Founders' Supply Co., of Newark, N. J., furnished a carload of equipment for the modern foundry, connected with this concern, which is being conducted under the direction of Mr. James Stretch, who obtained his early training with the well known Meriden Brittannia Co., of Meriden, Conn. The services of Mr. David Mosman have been secured as designer and the plant will be confined to the production of high grade work exclusively.

Besides being able to furnish castings of the finest quality for any purpose the Lynchburg Brass Mnfg. Co., will also produce a full line of stamped work of every description. E. A. Whiting, general manager of the company, has had a long experience with the best works in the New England States and the quality of the company's product will be second to none.

Obituary.

William Philip Abendroth, one of America's oldest and most prominent foundrymen, expired January 29th. His success furnishes an example of what is possible by perseverance and attention to details. To illustrate his interest in the affairs of his company it may be said though his business had attained a point where it was subdivided into numerous departments, he yet considered it necessary that he should give it his personal attention and he was at his office and shop every morning almost as early as any one in his employ until a paralytic stroke interrupted his methodical visits.

Mr. Abendroth was born in Germany December 18, 1818, and in 1832 arrived in New York in company with his parents. His stay there was brief, for he soon left the metropolis for Albany, where he began an apprenticeship in the foundry of Dr. Ephraim Nott. During the two years he remained

at his trade in Albany, he was a steady attendant at the night schools of that city, acquiring that technical education which later stood him in good stead. In 1834 Dr. Nott went to New York City and started the Novelty Iron Works, Mr. Abendroth accompanying him. There he finished his apprenticeship in 1836. His first employment as a journeyman was in the foundry of Bartlett Bent in Jersey City, which position he secured soon after completing his apprenticeship. His abilities as a molder were so evident, that in 1839 he was tendered the foremanship of the Bent foundry, but declined it, as his ambition tended to something better. He then went to New Orleans, which was then reached by slow sailing vessels. After a short period of recreation and labor in the Crescent City, he started up the Mississippi, and then up the Ohio to Cincinnati, O., and then to St. Louis, working for a while in both cities.

William Phillip Abendroth.

After a year spent in the South and Southwest, Mr. Abendroth returned North and secured employment in the foundry of George E. Waring, in Stamford, Conn. His service there was very brief, for within three months we find him forming a partnership in Port Chester with Philip Rollhaus. This was in 1840, and at that time was laid the foundation of the great firm and mammoth foundry now known as Abendroth Bros.' Eagle Iron Works.

Mr. Rollhaus retired from the firm in 1845 when Mr. Abendroth associated himself with two of his brothers. In 1876 the firm was changed to a stock company, Mr. Abendroth being elected president and remaining such up to the day of his death.

The name of Mr. Abendroth is so intimately connected with every progressive move of Port Chester, that our space is far too small to give more than a passing notice of his busy life. Besides the large plant which bears his name, he was instrumental in organizing the Port Chester Savings Bank, of which he remained president from its inception in 1865 until the time of his death. He had also served as a trustee of the First National Bank since 1863 and was one of its chief promoters. He took a prominent part in the affairs of Port Chester, and his administration as president of the village is looked upon as one which has never been excelled.

Mr. Abendroth took more than a passing interest in his employes and as early as 1852 aided in the organization of a building and loan association through which a large number secured their own homes. Approached in a kindly spirit he was one of the most indulgent men, but with that firmness of the man who will not permit himself to be driven from a position which he believed right, he was unyielding and immovable.

With the passing away of G. W. Smith, who died a few days ago at North Tonawanda, N. Y., is closed an active career of one of America's prominent foundry foremen.

Mr. Smith was 73 years old and remained in harness up to the time of his death as foreman for Armitage, Herschell & Co., of North Tonawanda, a position he accepted about three years ago. Although well along in years, Mr. Smith's appearance did not show his age, and by many he was taken for a much younger man on account of his sprightliness. Previous to coming to Tonawanda he had for many years been foreman of Bell's Engine Works at Buffalo, at which place he had been connected with the construction of some of the earliest steamers built for the great lakes, dating as far back as the early sixties, when cast iron was used to a greater extent in boatbuilding than nowadays and facilities were far less for turning out work than is now the case.

Some of these early steamers were equipped with cast iron shafts, and although these are now superseded by the better material of steel, still some of our good molders might have trouble to-day, in spite of all the education of latter years, to turn out such a casting of high quality.

Mr. Smith was one of the few foundry foremen who took as much interest in the welfare of those under him as he did in that of his employers. Being true to both, it is little wonder that his name is cherished by men all over the Union, who at one time or another came in contact with him.

As an evidence of his personal skill as a mechanic, he once told the writer that he

G. W. SMITH.

had himself made over 370 steam hammer frames for the well-known "Bell Hammer" within a period of 16 months, without losing a single casting. As these castings weighed from 800 to 6,000 pounds and were not the easiest job in the world, the statement was carefully remembered.

In personal appearance Mr. Smith was over 6 feet tall, straight as an arrow, and had a polite and courteous manner that with his other estimable qualities served to endear him to all who knew him.

His death removes a most prominent figure from the foundry world in Western New York and at the same time a man who had a national reputation among molders everywhere.

Henry Francis, a pioneer stove manufacturer, died in Spring City, Pa., January 17.

George E. Pevey, senior member of the firm of Pevey Bros., Lowell, Mass., died January 30.

The Utilization of Aluminum in the Arts.*

By ALFRED E. HUNT.

Until the present decade, the attention and research of everyone interested in the metal aluminum were directed almost exclusively to problems connected with the cheap production of the metal by means more adapted for large commercial operations than by the processes by which it had previously been manufactured.

The prevailing and popular opinion had been that if anyone should be fortunate and skillful enough to produce aluminum so cheaply that it could be sold at a profit at the price of a dollar per pound, the consumption of the metal would become enormous; and if it could only be sold at the price of fifty cents per pound—a price which, taking its relative specific gravity into account, would nearly approach that of copper and brass—the demand for the metal would be prodigious, and the profits which would accrue to the manufacturers would be of such fabulous amounts as simply to take one's breath away to attempt to estimate them.

Much of this sort of speculation has it been my lot to hear, and, I may truthfully say, to endure, from inventors of processes for the manufacture of aluminum (in my investigation as to their relative values), which have since proved to be either chemically impossible or commercially impracticable.

Early in the manufacture of aluminum, I had my attention sternly called by the necessities of the case to the fact, which further and larger experience has simply verified, that the problems connected with the promotion of the sale of aluminum, its adaptability for various purposes and the utilization of the metal and its alloys in the arts, were as difficult of solution as the problem of cheapening the processes for its production, and required as much research; offering a great many more opportunities for remuneration than would the search for cheaper modes of production.

*Condensed from a lecture delivered before the Franklin Institute, and published in the Journal of the Institute.

Aluminum is now selling in large quantities at 31 and 32 cents per pound, in ingots; and the relative increase in price for sheets, plates and bars, over the price for ingots, is not greater than that charged for either of the metals copper or brass.

While the partial replacement of brass by aluminum will undoubtedly take place, in accordance with the law of the "survival of the fittest," nevertheless, so great is the conservatism of tradespeople, that it will be only slowly that its relative merits and relative cheapness will win for aluminum its eventual position in importance as compared with the other common metals of large tonnage consumption, such as copper, brass, zinc, tin and lead. It has already met and outdistanced nickel in the amount of its consumption.

This lecture is given to outline in a general way the uses that have thus far been suggested for aluminum, and to give some account of properties of the metal and its alloys which have caused its demand in the arts.

As one of the most important uses of aluminum has been its utilization in the manufacture of steel ingots and steel castings, I think it well to commence with this special use of the metal.

Many attempts have been made to alloy aluminum in various proportions with iron and steel; but thus far no very satisfactory results regarding its use in iron have been obtained.

The influence of aluminum seems to be as a softener, rather than a hardener, for iron; and the more common use of alloying metals, as hardeners with steel, is therefore precluded in this case.

Aluminum combines with iron in all proportions, but an alloy of 50 per cent aluminum and 50 per cent iron, while casting into a solid mass, in a short time will crumble into a powder.

Aluminum is largely used in the manufacture of steel, the amount of aluminum used, however, being comparatively very small and varying with the grade of steel being made, the amount of occluded gases, the temperature of the molten metal, the size of the ingots or castings, etc.

In the manufacture of open-hearth steel ingots, the proportion of aluminum used is from 2 to 4, or at most 5 ounces of aluminum to the ton of steel; the aluminum being added in the ladle, as in the case of steel castings, or (with more economy in the use of aluminum, and in accordance with the general practice in the United States) as the steel is being poured into the ingot molds or groups of molds. Until the proper proportion of aluminum to add in any particular grade of steel has been determined experimentally, it is advisable to start with small lots, for instance, with 2 ounces to the ton of steel, increasing to, say, 5 ounces of aluminum per ton, according to the amount which is found necessary, noting the character of the results obtained.

It has been found that Bessemer steel ordinarily requires from 1 to 3 ounces more aluminum per ton of steel than similar grades of open-hearth steel, in order to have the same effect.

A steel which has become "wild," as it is called by the melters, or oxidized and overheated, requires considerably increased amounts of aluminum over what is used to advantage in ordinary cases.

The special advantages to be gained by the use of aluminum in steel manufacture are as follows:

(1) It increases the soundness of tops of ingots and consequent decrease of scrap and other items of loss, which more than compensates for the cost of the small amount of aluminum added.

(2) It quiets the ebullition in molten steel, thereby allowing the successful pouring of "wild" heats from furnaces, ladles, etc.

(3) It improves the homogeneity of the steel:

(a) By preventing oxidation.

(b) By that property of aluminum in virtue of which it rapidly permeates the body of the steel, thereby increasing the ease with which other metals will alloy homogeneously with steel.

(c) By decreasing the time that steel will remain fluid after being poured into molds and causing the steel when solidifying to do so more evenly, preventing a central core remaining molten longer than the outside portion of the metal, and in this way stopping the segregation of phosphorus and other impurities in the "mother liquor" of the metal remaining molten the longest.

(4) It increases the tensile strength of steel without decrease of the ductility.

(5) It removes any oxygen or oxides that may be in the steel, the aluminum acting, in

the same way as manganese does, as a deoxidizer. Good steel has been made for electrical purposes, using aluminum entirely in the place of manganese, to remove occluded oxygen and oxides from the molten steel and render it malleable.

(6) It renders the steel less liable to oxidation in casting. This is occasioned by preventing the continued exposure of fresh surfaces of the molten steel in its ebullition in the molds after pouring.

(7) It permits the production of smoother surfaced castings and ingots of steel than it is possible to obtain without the use of aluminum.

The chief advantage in the use of aluminum in steel is that first named, i. e., increasing the soundness of the tops of steel ingots and decreasing the scrap and other loss; and for this purpose the use of aluminum in the manufacture of steel is now becoming almost universal with the principal steel manufacturers, not only in this country, but also in Europe.

The phenomenon of quieting steel by the use of the very small proportion of aluminum referred to, is a very important and remarkable one.

Steel poured from a ladle into an ingot mold without being treated would ordinarily boil for ten to fifteen minutes before "freezing over" at the top, and when freezing would rise in the molds for 8 or 10 inches, with ordinary steel of 10-100 to 20-100 of 1 per cent carbon, unless heavy chills are placed on the tops of the ingots. When aluminum is added, however, the steel will come up to the required level and remain there, freezing over within thirty to forty five seconds after the last of the steel is poured into the ingot mold.

Comparative results of the use of aluminum in steel can readily be shown by pouring two ingots side by side, from the same ladle of molten steel, one treated with aluminum in the ingot mold and the other not so treated.

There is danger in adding too large a quantity of aluminum to ingot steel, in which case the metal will settle very solidly and will be liable to form deep "pipes" in the ingots. To add just the right proportion of aluminum to the steel requires some experience on the part of the steel manufacturer.

This danger of the piping of the metal is not a serious one in ingot steel if care be taken to determine just the right proportion of aluminum to use, in order to prevent the formation of too many blow-holes at the top of the ingot. With the metal entirely solid—that is, with too much aluminum added—the shrinkage, due to contraction, will produce pipes, which will occasion a serious amount of crop ends or defective steel at the top of the ingots.

In the case of the manufacture of steel castings, this trouble is not experienced; the problem is simply to get a solid steel casting, and much larger proportions of aluminum are added in castings than in the practice of making steel ingots, the piping, due to shrinkage in the metal, being taken care of in the large "riser" or sinking-head, which is provided for steel castings.

No difficulty has been experienced with the thorough mixing of the aluminum added to steel, as it seems rapidly and uniformly to permeate the metal without any special care being taken in stirring. This property aids in the homogeneous alloying of nickel and other similar metals to steel as well; and steel manufacturers use aluminum in addition to nickel for this purpose.

Mr. R. A. Hadfield, of Sheffield, England, says that the influence of aluminum in steel appears to be like that of silicon, though acting more powerfully. The same writer (who is confirmed by Howe and Osmund) claims that an addition of aluminum does not lower the melting point of steel, i. e., that the critical point is about the same whether aluminum be present or not. It is the aim, however, in adding aluminum to iron or steel, to add just enough to combine with all the oxygen present, but to leave no trace in the ingot or casting; any more than this is not required.

Mr. J. E. Stead states that in a case where aluminum had been added to ordinary soft open-hearth steel with properly prepared molds, the castings were very sound indeed. The test bars, which were cast about 8 inches long by 3-4 inch square, were perfectly sound, and had a tensile strength of 40,000 pounds per square inch; whereas the same bar, without aluminum, only stood 20,000 pounds, the reason being that in the ordinary steel without aluminum the cavities were very numerous. A few hundredths of 1 per cent of aluminum in that casting increased the weight and solidity and reduced the blow-holes by 23 per cent.

Aluminum is the principal deoxidizer known to metallurgists, the next in efficiency being silicon. Their relative values are as follows: 100 parts by weight of oxygen will combine with 114 parts of aluminum, or with 140 parts of silicon, or with 350 parts of manganese. This, however, does not correctly express the value of aluminum as a deoxidizer of iron and steel, as it has so great an affinity for oxygen that it will entirely disappear if there is any oxygen present, and will be found in the steel and iron only after all the oxygen contained therein has been absorbed. This is not the case with either silicon or manganese, as either or both of these are often found in the steel when oxygen is present. There is also an additional inducement for the steelmaker to use aluminum, namely, in the cost, for the use of silicon will add from 87 cents to $1.12 to the cost per ton of steel, while sufficient aluminum will not add over 10 cents, and in many cases not more than 6 cents per ton, to the cost of the steel. The saving in bad castings, or unsound ingots, will repay this many times over. One large English steelmaker estimates his savings from this source alone at over £2,000 per annum. The special advantage to the steelmaker seems to be that aluminum combines the effects of both silicon and manganese.

In most common practice, aluminum is added to steel in the form of the pure metal. In this form, it has the advantage not only of quickly melting and homogeneously alloying, but the manufacturer knows also just how much aluminum he is adding, which is not the case if he purchases alloys of aluminum for adding to the steel.

Some manufacturers, however, prefer to use ferro-aluminum rather than pure aluminum, in their practice.

In this country, the alloy is first placed in the steel ladle, the molten steel from the open-hearth furnace or converter is run in and the alloy is melted and diffused through the steel.

Ferro-aluminum is a trade-name given to 5 or 10 or even 20 per cent of aluminum alloyed with iron. Either a good grade of cast iron, free from sulphur and phosphorus, or of pure steel low in these elements, is the best material to be used for the purpose of alloying with the aluminum.

Most users of ferro-aluminum make their own ferro-aluminum by adding known weights of pure aluminum to known weights of steel or iron mixture with which they wish to alloy, casting the mixture into convenient molds.

In the past, ferro-aluminum could be purchased at a cheaper rate per unit of aluminum than the pure aluminum; but this is not the case at present, as pure aluminum can be bought as cheaply as the contained aluminum in any of the alloys.

In cast iron, from 1 to 2 pounds of aluminum per ton is put into the metal as it is being poured from the cupola or melting furnace. To soft gray No. 1 foundry iron, it is doubtful whether the metal does much good; but where difficult castings are to be made, where much loss is occasioned by defective castings, or where the iron will not flow well or give sound and strong castings, the aluminum certainly in many cases allows better work to be done and stronger and sounder castings to be made, having a closer grain, and hence much easier tooled. The tendency of the aluminum is to change combined to graphite carbon, and it lessens the tendency of the metal to chill. Aluminum in proportions of 2 per cent and over, materially decreases the shrinkage of cast iron.

The effect of aluminum in wrought iron is not very marked in the ordinary puddling process. It seems to add somewhat to the strength of the iron, but this increase is not of sufficient value to induce the general use of aluminum for this purpose. The peculiar property of aluminum in reducing the long range of temperature between that at which wrought iron first softens and that at which it becomes fluid, is taken advantage of in the well-known Mitis process for making "wrought-iron castings." It is for this that aluminum is most used in wrought iron at present.

Cast aluminum can be very much improved in rigidity and tensile strength if afterwards subjected to the drop-forging process. For special light-running machinery, drop forgings of nickel-aluminum casting metal are particularly well adapted.

(To be continued.)

The Modern Foundry.

By S. S. KNIGHT.

The writer has often noticed while visiting foundries, with which he has neither had nor is likely to have any connection and which are oftentimes managed by the most competent and economical superintendents,

that many features about these various plants will show the most profligate extravagance and waste, while possibly at the side of these same systems which we have criticised, will be noticed the application of other schemes which are almost parsimonious in their intended economy. It is therefore our purpose to briefly describe, in a general way, a modern plant, and to touch upon the most prominent points to be observed in its operation.

We fully appreciate the fact that the location of a shop has very much to do with the economy which can be exercised in its management. Under this division of our subject should be noted the obvious disadvantage under which many works are operated. An instance in illustration of this will be found in any plant which is located only a few miles from some large city or local metropolis, just too far out to be accessible by street railway and too near town to afford inducements to the men employed to build their homes within near proximity. At any place so situated a higher rate of wages will necessarily have to be paid to the employees in order to obtain men equally as good as those employed in the neighboring city for a similar purpose. This directly follows since not only will the same scale of wages have to be paid as is in force in the city, but also the cost of transportation from the city to the plant in question. We are fully aware that many instances may be cited contrary to this statement, namely, where manufacturers have built a town, in which their employees may at a moderate expense reside, but in most cases where even this scheme was employed, the avarice of the employers or the corrupt mismanagement of their affairs has so thwarted the original purpose of the builders that their town has become dilapidated and the buildings no longer fit for occupation, or the rents have been made exorbitant, and the necessities of life have been made the cost of luxuries. It will be seen that where there are a few exceptions to this rule of advantage of location there are not enough to disprove it or contradict its truth. Other prominent features under location, are those which are universally recognized such as transportation facilities both of the crude materials and also of the manufactured products, but those we will pass by as being too universally accepted to require further notice at this time.

We now come to the buildings themselves, and their equipment. In this particular class of work, as in all others, the two greatest requisites are a sufficiency of light and good ventilation. Concerning the manner of obtaining these two ends we may profitably leave all discussion to experienced architects. However, it would only be apropos to state that whatever ventilation or light is obtained through windows upon the roof that some way should be provided for keeping out the rain and snow as well as letting in the pure air and the glorious sunlight of heaven. Although both water and heat are appropriate in their proper places in the molding floor, yet at the same time the relying upon Providence to dampen the sand before cutting it and the patient waiting on the same source to furnish warm sunlight to dry the mold, are hardly economical either to a molder working on piece work or to his employers, if he is paid by the day. This state of affairs as depicted here may seem to be overdrawn, but, however, the fact remains that in many of the so-called modern plants to-day the rain is allowed admittance through the roof to the certain inconvenience of the molders employed.

Passing from this phase of the subject to the obtaining and application of motive power, we have here a field amply broad to furnish material for several books, any one of which would be much larger than this edition of THE FOUNDRY. We will, however, touch upon a few points which may be of interest, not because they are all examples of the best practice, but rather because they may furnish food for contemplative thought. Probably the greatest violation of the laws of the economical application of power is found in the distribution of energy as seen in many of not only the large, but the smaller, manufacturing plants of the country. How many times will the careful observer, while visiting shops other than his own, notice the careful centralization of furnaces and boilers and the reckless distribution of stationary steam engines and like motive apparatus. The writer well remembers visiting one plant where four batteries of boilers were carefully housed under one roof, the nearest engine, over 150 horse power, being located nearly 100 yards from the boilers, the steam being conveyed to it in a four-inch wrought iron pipe. A careful computation of the amount of energy which was actually utilized (computed from the careful analysis of the coal used) showed

that all but 6 per cent was lost, notwithstanding the fact that the engine in question was one of the most efficient types of the Corliss machine that has ever been constructed. How much better would it have been to have used the steam in the same engine situated but a few feet from the boilers, and have employed a dynamo capable of putting into the lead wires 97 per cent of the energy turned into it, and using, in place of the engine 100 yards away, a similar electrical machine able to transform the electrical energy into mechanical motion, with only a loss of less than 5 per cent.

Another instance of consummate extravagance along mechanical lines is to be found in almost every plant which employs a high potential electric circuit for power purposes. We have known many cases where a 550 volt current was used to run electric traveling cranes, stationary motors, from one to one hundred horse power, incandescent lighting systems, and low potential arc lights. While in the first two cases the use of such a current might be called advantageous, yet certainly for lighting purposes it was far from it. By actual experiment with five 110 volt incandescent lamps burning in series upon the same line and rated as 1,000 hour lights, the first two lasted less than 200 hours, and the last burned out before 500 hours. This may seem strange, but upon a little reflection will prove to be perfectly rational, for no machinery has as yet been built which will produce a current of constant potential under rapid maximum variations of strength. Nor would it seem that the employment of long-lived low tension arc lights, burning either singly or in series, would be economical when the difference between the voltage of the line and the single or recombined voltage of the lights, as the case might be, would exceed 25 per cent. Yet in how many shops could we enter today where we will find economical systems employed either in applying of power or the distribution of energy? Even in power lines the tendency would seem to be to use high voltage circuits in place of those of lower potential and greater strength of current. While high tension machines undoubtedly have the advantage of light weight they also have the disadvantage of being far more liable to burn out, in both armature and fields, than those wound for lower voltage. The greatest trouble seems to be to-day that men in charge of foundries are too apt to be molders only, and do not fully understand all over which they have control, but rely upon the supposed knowledge of their assistants to furnish them what technique may be required in the performance of their duties.

Since the recent business depression much agitation has been felt among those who occupied positions of lower importance, especially among those who were following some trade. Foundries have been no exceptions in feeling the stringency of the times and have in many cases been forced to lower their schedule of wages in order to give their employees any work whatever. This has in many instances led to disastrous strikes and in many ways alienated the interests of the manufacturers from those of the laborers whom they employed. Trades unions have become more numerous and also more aggressive, until within the past few months manufacturers have sorely felt the need of a close affiliation of their interests and have founded in some localities a protective association. The influence of this association, it would seem, would be to oppose that of the trades unions, and as to how successful it will be remains for the future to demonstrate. Although it is legitimate for manufacturers to take this step, yet it seems as if it were beginning the saving at the wrong end, for although labor is and has often been in the wrong, yet it would seem that manufacturers still have large opportunities to make many savings without cutting down the wages of their employees.

Some time since we had the privilege of visiting a shop which had been the scene of quite an extensive strike. The management wished to cut the wages of their employees 10 per cent, and the result was that a strike ensued. It may here be said that if ever a reduction seemed justifiable this one did. Upon investigation it was ascertained that the molders were paid upon the piece work system, and the majority were making before the reduction over $3 per day. The work cast was mostly light and of a difficult nature to mold, very few machines being employed. The company had been in straightened circumstances for some time. Upon close investigation it was found that although soft fluid iron was desired, yet high sulphur coke and low phosphorus irons were being used. The cupola was managed by incompetent men and no ladle of iron left it without containing slag. It would seem that in the face of these conditions that a more

profitable way to cut down expenses and increase profits would be to use modern methods and save their castings, thus avoiding the necessity of a reduction.

Before concluding we wish to call attention to an example of foundry practice which it would seem stands almost without a precedent. This foundry also makes thin, light castings, varying in thickness from one-half ounce to two tons in weight. Most of their castings, however, are gear wheels, which are the bete noir of all foundrymen. The molders are employed by the day and daily heats run from thirty-five to forty tons. Notwithstanding the castings are light and of intricate design, the percentage of loss is under 2 per cent. It certainly speaks highly of the superintendent that he has been able either by his own personal effort or by that of his associates to bring about so desirable a state of affairs.

The writer firmly believes that in the near future capitalists will be forced to employ men of sterling worth and possessing a knowledge of technique as well as of general business affairs if they would be able to remain in the field abreast of their competitors.

The close competition which the recent business depression has caused has made it obligatory for the owners of manufacturing plants to employ men of the highest standard of excellence, regardless of what means must be used to this end. The successful foundry superintendent must be a mechanic as well as a manager, and a scientist as well as a business man. He must not only have a vague knowledge of the applied sciences, but an understanding of their principles in detail.

He must not only know of Ohm's or Avagadro's law, but should be able to figure the winding of a dynamo for any purpose, and be familiar with chemical tests in the field in which he is working.

The Pewabic Founders.

(By Telegraph.)

At the last meeting of this association, held Friday evening, at Pewabic, the president, Pumice De Witt, of the De Witt Sausage Machine Co., complimented the members upon the influence they were already exerting to place the foundry business upon a sound basis. His recent trip east had convinced him that there were more honest men in Pewabic than in Washington, and that if any legislation, favorable to the foundry business was to be enacted, it would be necessary for the Pewabic Founders to establish a legislative fund to further their interests.

Major Mathias Pocahannis, of the Skinner Co., Skinapolis, was unanimously elected to membership.

No report was presented by the executive committee and it is understood that none will be forthcoming until the members can arbitrate their political differences. The chairman of the committee, Flux McFadden of Coon Hollow, is known to have asserted that it will be impossible for the foundrymen of America to receive a comfortable return upon their investment until the independence of Cuba has been secured. This idea is opposed by the other members of the committee, Pasty Groesbeck of Bungtown, and Tubal C. Klaiwash of the Bulldozer Co., Paradise Flat; the former insisting that the duty on castings must be raised before stocks in foundries will sell above par, while the latter as positively proclaims that politics are the cause of blowholes, and that the foundry, which relies on the government to make its business successful is sure to be disappointed.

Secretary Hellso suggested that in order to hear a report from some committee each month it would evidently be necessary to appoint more committees. The largest single item by weight as well as by volume, which entered into the production of castings had never been given any consideration whatever by the different so-called Foundrymen's Associations who seemed more inclined to study bacteriology, microbes, trichinosis and molecules, than to talk about things they could understand. None of them had considered the question of Wind under its different aspects and he favored the appointment of an intelligent committee, which could develop a plan by which the foundryman might be enabled to lift himself by the bootstraps. Upon motion, duly seconded, the following gentlemen were appointed as a committee on wind, with instructions to carefully note its temperature, direction and velocity: Prof. Hink Hokum, Squan Creek; Maj. Mathias Pocahannis, The Skinner Co., Skinapolis; Col. Phineas Snort, East Squakit.

A. Malgam, of the Twister & Scooper Co., Pokedelphia, said that while it should always be the object of the Pewabic Found-

ers to flatten out original phenomenas, there was one feature of the foundry business which the members of other associations had been in a hurry to take up and tell others how they might do, but slow to act upon individually. He referred to the apprentice question which he thought had been juggled with until it was nearly prepared for burial. There was something decidedly humorous, the speaker said, in observing the frantic efforts made by some people to secure the floor for the purpose of informing the world at large that the molders were holy terrors, and their speechmaking appeared to exhaust their vitality to such an extent as to prevent them from doing anything for the improvement of the molders in their own shops. The foundrymen at large were dead anxious to have somebody prepare a set of indentures, but blamed slow in filling them out.

Wayback Gulliver thought the greatest trouble with foundrymen nowadays was, that they couldn't do anything unless they had a blank to fill out. The apprenticeship question had been kicked around until the members of the older associations had sore toes, and after all he believed all of these reformers had never done a thing to secure better mechanics, nor even adopted the very indentures they advocated in their own works. They seemed to glory in preparing medicine for somebody else to take. The speaker called the attention of the committee on wind to the lung power of these reformers and suggested that a member of the Pewabic Founders be sent to Chicago in disguise to locate the source of the supply. In the meantime he favored the appointment of a committee on apprentices by the Pewabic Founders, as it was evident they could not do worse than others and might accidentally do better. Alick Whackdem, Whackdem Iron Works, Pewabic; Wayback Gulliver, Pipers Gulch Mnfg. Co., Pipers Gulch and John Gaggerless, of the Bungtown Agricultural & Bedspring Co., Bungtown, were appointed as a committee on apprentices by the chairman.

The secretary asked those present to give their impressions of the trade outlook and to add such suggestions as would be likely to prove of value.

Sublime Cannon, of the Rainbow Chaser Co., Pumpkinville, said that with an early rain the ground would be put in good condition to receive the spring crops, and add considerable to the demand for agricultural tools.

Pumice De Witt, of the De Witt Sausage Machine Co., said the season had been a poor one for his output. The evenings had been longer than usual and people had taken advantage of this to grind their food by natural means. With the advent of spring, however, he felt confident that more meat would be consumed and that a new era would be inaugurated, the like of which had not been seen since the Swedes landed in Delaware.

Constant Humpon made a lengthy speech in favor of an international agreement relative to the stopping up of cupolas. The speaker pointed out that the promotion of scientific founding demanded a universal rule for calculating the size of tapping holes and the length of bodsticks. The foundryman was the most obstinate animal known to science and, as a rule, had to be operated on with a cross-cut saw before he would institute reforms or see himself as others see him.

The following resolutions were unanimously adopted:

"That the Pewabic Founders declare themselves in favor of maintaining the gold standard and the price of cast iron on a sound basis and respectfully urge the enactment by the Senate and House of Representatives of the United States of necessary laws to strengthen the walls of loam molds on the lines laid out and recommended by the Pewabic Founders and concurred in by the Moneyless Commission of Pokedelphia.

"Resolved, That the Pewabic Founders heartily concar in the sentiments expressed by Fitzsimmons and Corbett and pledge to them the support of the Pewabic Founders in their efforts to maintain the credit of the United States."

Testing Car Wheels.

In our last issue was illustrated and described some tests made upon cast iron wheels by the New York Car Wheel Works and the P. H. Griffin Machine Works and by an oversight we forgot to state that the test requirements quoted for Austrian, German and French railways are intended to be carried out only on steel and steel-tired wheels. That the New York Car Wheel Works should have sufficient faith in its cast iron wheels to submit them to the

severity of these tests speaks well for their product. That the wheels made by this company withstood such trying ordeals is a great testimonial, not only to the manufacturers, but American Foundry Practice as well.

In connection with illustration on page 270 of our last issue, paragraph reading "Weight in position under Austrian State Railway Test" should read "weight in position for first blow under Austrian, etc." The photograph was taken after the wheel had been struck a number of blows from a height of six metres, a distance too great to be incorporated in the picture, hence the illustration shows the weight in position for first blow only. On page 273 after the sentence "Wheel must stand six blows in succession" should be added "without bursting in pieces."

Another series of tests were made by the same company on January 21, under the supervision of the committee appointed by the Central Railway Club at their November meeting, the committee consisting of Mr. A. C. Robson, Division Master Car Builder of the Lake Shore and Michigan Southern Railway; Mr. J. A. Bradley, General Foreman, Car Department of the New York, Chicago and St. Louis Railway, and Mr. Robert Potts, Division Master Car Builder of the Michigan Central Railway, St. Thomas, Ont.

In addition to the different tests enumerated before, which all demonstrated the high quality of the New York Car Wheel Co.'s product, the thermal test of the Pennsylvania Railroad was also introduced. The following are the requirements of this test: "Wheel laid flange down in the sand and a channel-way an inch and a half wide and four inches deep molded with green sand around the wheel. This channel-way will then be filled with molten cast iron; two minutes later an examination of the plates will be made. Wheel to be accepted, must not be broken in pieces, and the cracks in the plate, if any, must not extend through the tread." It took just fourteen seconds to fill this channel at the recent test and the wheel stood the ordeal without failure of any kind.

Besides the tests referred to, The P. H. Griffin Machine Works and the New York Car Wheel Works were thrown open throughout to the visiting officials, and the process of manufacturing and finishing wheels was inspected in every detail from the smelting of the iron to the completion of the finishing work. The methods followed by these works in their daily manufacture whereby the quality of every wheel is positively assured before delivery for service were also explained.

The laboratories, and testing rooms, for the strength and wearing qualities of the wheels were also visited and tests were made from the preceding day's work to explain the methods followed.

A large exhibition was made of electric wheels of different diameters and sizes used by the leading electric railways at home and abroad.

An exhibition was also made of the special qualities of charcoal iron used in the manufacture of the special wheels tested and by means of which it is possible to attain the exceptional results obtained on the tests. Samples of wrought iron, both finished and unfinished, were exhibited, made from the special iron referred to besides samples of different high-grade alloys used in the process of manufacture.

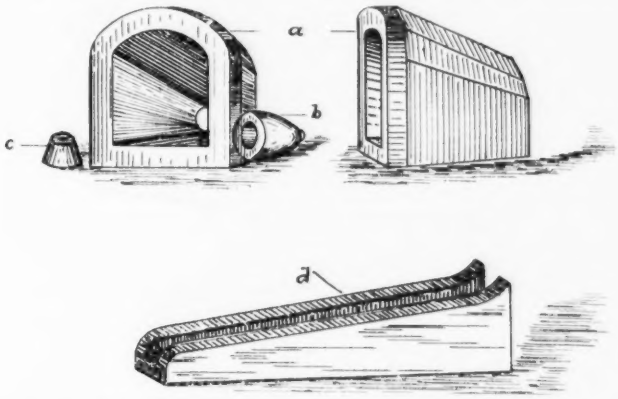
The members of the club and visitors all expressed themselves as highly gratified and interested in the results and the staff of both establishments were more than pleased with the same. When it is considered that the test on car wheels used in America consists of dropping a weight of one hundred and forty pounds from a height of twelve feet from five to eight times, as proving the value of wheels to be accepted for service, as compared with tests made with weights from five hundred to two thousand two hundred pounds dropped from heights up to twenty feet, it will be plainly seen how much more severe the latter tests are. It must, of course, be understood that the European tests used are intended for steel-tired wheels only, and in erecting the necessary testing machinery and subjecting chilled wheels to such severe tests it was the intention to prove that chilled wheels could be made equal to, if not superior in strength and wearing qualities to any manufacture of steel-tired wheels that could be found, and at less than one-third the cost. The chilled wheel possesses the unusual feature of having a scrap value of about fifty per cent of its original cost.

One question, worked out and answered by your own efforts, results in more practical good to yourself than ten questions answered by your neighbors.

The Moore Cupola Breast.

Where long heats have to be taken from one cupola, the question of keeping the spout and tapping hole free from accumulations of slag presents itself with more force than where short heats are the rule. Many cupola tenders realize this and give their spouts a coating of blackwash, which is very good as far as it goes, but the rough treatment bestowed upon this part of the cupola prevents the application of blacking from lasting more than a comparatively short time.

To make the handling of long heats easier, Mr. Moore, foreman of the foundry of Stanley G. Flagg & Co., of Philadelphia, has for several years employed a breast, stopper and spout made from the same material as plumbago crucibles, to which, as is well known, neither slag nor iron will adhere.



Our illustration shows the different parts composing an outfit, a being front and side view of breast, b the stopper, c a ring or thimble which is used in case the opening after a time becomes too large, d shows the outline of the spout ready to be placed in position. With ordinary care the spout will last several years and the breast beyond six months. To the greater cleanliness in favor of this spout should also be added the time saving feature of doing away with the daily building of new spouts and breast. Mr. Moore has been granted a patent on this improvement and the J. W. Paxson Co. have been appointed sole agents for the United States.

A Regular Gold Mine.

The dollar invested in THE FOUNDRY yields the largest returns.

V. W. DYKEMAN,
St. John, N. B.

A Machinist's View of the Foundry.

By STERLING ELLIOTT.

Much has been written concerning the foundry, though very much more has been said.

Comparatively few practical mechanics ever take the trouble to put their grievances on paper, yet they all have them, and, perhaps, no cause of trouble in the machine shop gets more verbal condemnation than the foundry.

Sometimes the poor molder is blamed for that which was no fault of his, and again, he does things which put him, for the time, outside any reasonable hope of forgiveness. When the irate machinist refers to the foundry men as "ground hogs," I don't think he really means any more than when he uses the "pronoun damn" to soothe the pain of a pounded finger, but it relieves his mind.

A foundry foreman recently told me that he found it difficult to get really intelligent boys to learn that business. Of course there are many journeymen molders who have brains and use them, while among the foremen of leading foundries are some of the best of heads. I have no fear of offending any of the fraternity, for such of them as read the "American Machinist" are no doubt able to make something beside blowholes.

Dear reader, did you ever take a nicely finished pattern into a foundry for half a dozen castings and have it come back a wreck? Did you have some tapped plates let into the top side of it and send along a set of eyebolts with which to lift it out of the sand? And did they overlook all this and drive that blunt-pointed weapon known as the "molder's delight" into the pattern until they had made a three-fourths inch hole where the wood was only three-eighths of an inch thick?

I have seen molders who could make many ordinary shapes without a pattern, and I recently saw a most perfect casting, the pattern for which was a delicate china tea cup, saucer and spoon, the three forming a single casting of iron almost equal in shape and finish to the originals; and still another instance of "gumption" on the part of a molder was a casting, the pattern for which was an ordinary grasshopper. The method by which this latter was made was as follows: The grasshopper was washed with a thin solution of clay and water. When this was dry a second coat was applied, this time a little thicker, each succeeding coat containing less water, until Mr. Grasshopper became a ball of clay, which when thoroughly dried, was placed in an oven until the clay was hardened and the unfortunate insect cremated, after which it was a comparatively easy matter to rattle out his ashes and pour in the metal. But the molders who do these things are in the hopeless minority.

The castings used in a machine are its foundation, and unless they are sound the machinist is sometimes literally building on quicksand. I have known cases in which dollars have been lost in the machine shop for the sake of saving pennies in the foundry. I believe that this should not be. The first place to spend money is in the making of satisfactory castings. If there are sufficient brains in the foundry less will be needed in the machine shop.

If good castings can be had at a moderate price, so much the better, but the question of quality should be first considered. If the more intelligent hesitate at taking hold of the founder's trade, it should be made more attractive, for there is no department of the machine business where the boy "with a head on him" can be more useful, and I believe it to be the last department wherein any false economy should be tolerated.—American Machinist.

To foundrymen throughout the country there is a certain air of familiarity in the name of the Hill & Griffith Co., a new concern which has entered the foundry supply business at Cincinnati, Ohio. They have procured a site on the C., H. & D. Ry., close to the Resor Stove Foundry, and are installing modern machinery which will enable them to supply a high grade product. Messrs. Hill and Griffith have for many years been connected with the business which they are now entering on their own account. They have secured the services of Mr. Wasmer, who was superintendent of a large concern for a number of years, and Mr. Crewett, who in the preparation of facings of all kinds has probably had more experience than any other man in America. It will thus be seen that the Hill & Griffith Co. have surrounded themselves with the best of talent, and there is every reason to expect that whatever they place on the market will be second to none.

White Metal for Patterns.

The white metal ordinarily used for making patterns is what is commonly known as Brittania metal. There are several mixtures that give one form or other of this metal, but in the foundry where only a limited quantity of it is used, it is generally secured from scrap metal dealers. Much of the so-called silverware on the market is nothing but Brittania metal, but in purchasing it you must be careful or the dealer will palm off on you an alloy that is nearly all lead, and that is almost useless for your purpose. The heavier parts of old coffee pots, cruets, etc., are usually of this undesirable description, the lighter parts as a rule being of a better quality and more suitable for your purpose, but its selection is a matter of experience and judgment. An alloy of 80 parts tin, 17 parts antimony and 3 parts copper, will also be found suitable, while an alloy of tin and antimony alone, in varying proportions according to the class of work, of from 9 to 4 of tin to 1 of antimony will also give a white metal that may answer, but the scrap Brittania has both the virtue of cheapness and superiority. But no white metal can be secured that is not liable to break off with continuous rapping. If the patterns are of white metal the gates should be of brass and either securely brazed or rivetted on.

Don't pour too hot; it is about right for pouring light castings when a dry pine stick used for stirring it smokes on immersion. For heavier castings it should be poured when the surface of the metal preserves a clear, bright appearance when the scum is pushed back.—Iron Molders' Journal.

A Good Thing.

A good thing ought to be pushed along, and there is nothing better than THE FOUNDRY.

E. H. PUTNAM.
Atlanta, Ga.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.
Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

FOR SALE—First class cupola and six-ton foundry jib crane. Pawling & Harnischfeger, Milwaukee, Wis.

FOR SALE—Brass Foundry; 16 years established; good chance for two young men, molder and finisher. Address "Brass Foundry," Box 121, care THE FOUNDRY.

LARGE IRON FOUNDRY for sale or lease on long time. One of the best plants in Chicago. Fully equipped. Write for all particulars. Address E. E. R., 1155 S. Paulina street, Chicago.

FOR SALE CHEAP—The Colliau Hot Blast Cupola manufacturing business of the late Victor Colliau, including patent rights, machinery patterns, etc. Address V. COLLIAU, JR., Admstr., 949 Third Ave., Detroit, Mich.

WANTED—Position as foreman. Am out of position by reason of closing of plant. Fifteen years' experience on light and heavy machinery and jobbing work. References given. Address T. O. Henry, Ironton, Ohio.

WANTED—Position as foundry foreman by practical man, on light and medium heavy castings. Good manager on day or piece work system. Correspondence solicited. Address "Piecework," Box 118, care THE FOUNDRY.

BARGAINS IN BLOWERS—We have on hand two No. 6 second-hand blowers, taken in trade for larger machines; thoroughly overhauled and guaranteed as good as when new. P. H. & F. M. ROOTS CO., Connersville, Ind.

WANTED—Position by a competent molder as assistant foreman or will accept work on the floor. Experienced in either green, dry sand or loam work. References furnished. Address "A," Box 112, Care THE FOUNDRY.

WANTED—A thoroughly experienced annealer of malleable iron castings, or young man who has been an assistant in an annealing department; references required. Address 'ANNEALER,' Box 113, Care THE FOUNDRY.

TO RENT.—Architectural Iron Foundry, with Cranes, Cupolas, Patterns, etc., complete. Plant includes Pattern Shop, with Power Planer, Lathes, Saws, etc. Address Post Office Box No. 3,443, Station "O," Philadelphia.

WANTED—Position by a young man with 9 years' experience as a molder. Accustomed to all kinds of jobbing work and molding from sweeps. Strictly temperate. References furnished. Address "Position," Box 115, care THE FOUNDRY.

WANTED—Position as foreman by a young man with fifteen years' experience in the malleable iron business. Foreman for past two years in a leading malleable foundry. Competent to take complete charge of foundry department. Address "Malleable," Box 117, care THE FOUNDRY.

FOR SALE, in Northern Texas—Foundry and machine shop with increasing trade. Well located, 30 miles from competition. Doing good business in repair and contract work. Have one contract for castings of from 6,000 to 20,000 lbs. per month. Address "Texas," box 110, care THE FOUNDRY.

SITUATION WANTED—By a practical foundry foreman, who understands the making of all kinds of plumbers' supplies, soil pipe and fittings, light and heavy castings; experienced in the mixing of iron and can handle men to advantage; references furnished upon application. Address W. H. G., 144 Fifteenth street, Detroit, Mich.

WANTED—A foundry foreman and assistant superintendent in a large stove foundry; a man who has practical knowledge of stove plate molding and foundry practice. No applications will be considered that do not state age, references, experience, present or last employers and salary expected. Address "Stove Manufacturer," care THE FOUNDRY.

POSITION WANTED.—I am looking for a chance to better myself. Learned my trade in the famous Sulzer foundry of

Winterthur, Switzerland. For the past fourteen years have held my present position as foreman. Specially experienced in pump work and medium and light castings of all kinds. References given. Address, S. J., Box 120, care THE FOUNDRY.

FOREMAN WANTED.—One of the largest and best known foundries in America will shortly be in a position to engage a general foreman for their foundry. Applicants must be competent to turn out creditable work in loam, dry sand or green sand, and be capable of handling men and material to the best advantage. Address, stating age, experience and references, "General Foreman," Box 119, Care THE FOUNDRY.

A GENTLEMAN well known to the foundry trade will be at liberty shortly to accept a position as manager or superintendent of a foundry plant. Is a practical mechanic in all that pertains to foundry practice, both in iron and brass, chilled rolls, car wheels, etc., and capable of handling a large number of men with best results; is a thorough business man in buying, selling, making estimates and contracts. For a number of years past has been manager and conducted the entire business of a large foundry plant, and has an extensive acquaintance with railroad officials throughout the west and south; highest references furnished. Address box 93, care THE FOUNDRY.

By Way of Advertising.

The Cowles Electric Smelting & Aluminum Co., of Lockport, N. Y., have issued a little booklet, which deserves the appreciation of founders in general. It describes the method of using Manganese and Silicon copper, Ferro aluminum and other alloys and their influence upon different metals. A copy will be mailed upon application.

Fay & Scott, of Dexter, Maine, have issued a special catalogue of Pattern-makers' Lathes, of which this firm has made a specialty for many years. In order to insure economical production, the pattern shop as well as the foundry should be looked after, something which is not always done. A copy of this catalogue will be forwarded upon application to the manufacturers.

The "House Warming Manual," compiled by Sidney P. Johnston, has been issued by the American Artisan Press, Chicago. As its title indicates, the book deals with a problem in which we are all more or less interested. It contains 270 pages profusely illustrated, treating of hot water, steam and warm air heating. The plans, estimates and ideas advanced in this book should prove a valuable addition to the already existing literature on the subjects of which it treats. The price of this work is $3.50.

The Brown & Sharpe Mnfg. Co. of Providence, R. I., have issued their 1898 catalogue which is mailed free to any address upon application. Besides the large assortment of machine tools manufactured by this firm, the catalogue also describes several appliances of interest to foundrymen, such as core-boxes, core ovens, tumbling barrels, rubber-tipped rammers, etc. These were originally made only for use in the home establishment, but their many good features made them sought by others, and now form part of the regular line of articles made by the Brown & Sharpe Mnfg. Co.

Personal.

Geo. B. Cobb has been elected vice-president of the Roberts Machine Co., Collegeville, Pa.

Miller, Wagoner & Bentley, of Columbus, O., dealers in pig iron, coke, etc., have taken into the firm Mr. Louis F. Fieser and will hereafter be known as Miller, Wagoner, Fieser & Co.

J. C. Warner, formerly with the New York Car Wheel Works of Buffalo, N. Y., has accepted the position of engineer with the Pennsylvania Car Wheel Co., Pittsburg, Pa.

The molder who works without thinking is always wondering why he does not get a show.

The president of a company may draw the largest salary, but he does not always earn the dividends.

The Finest.

THE FOUNDRY is the finest magazine I have ever seen. Every molder ought to have it.

W. T. LEE.
Waynesboro, Pa.